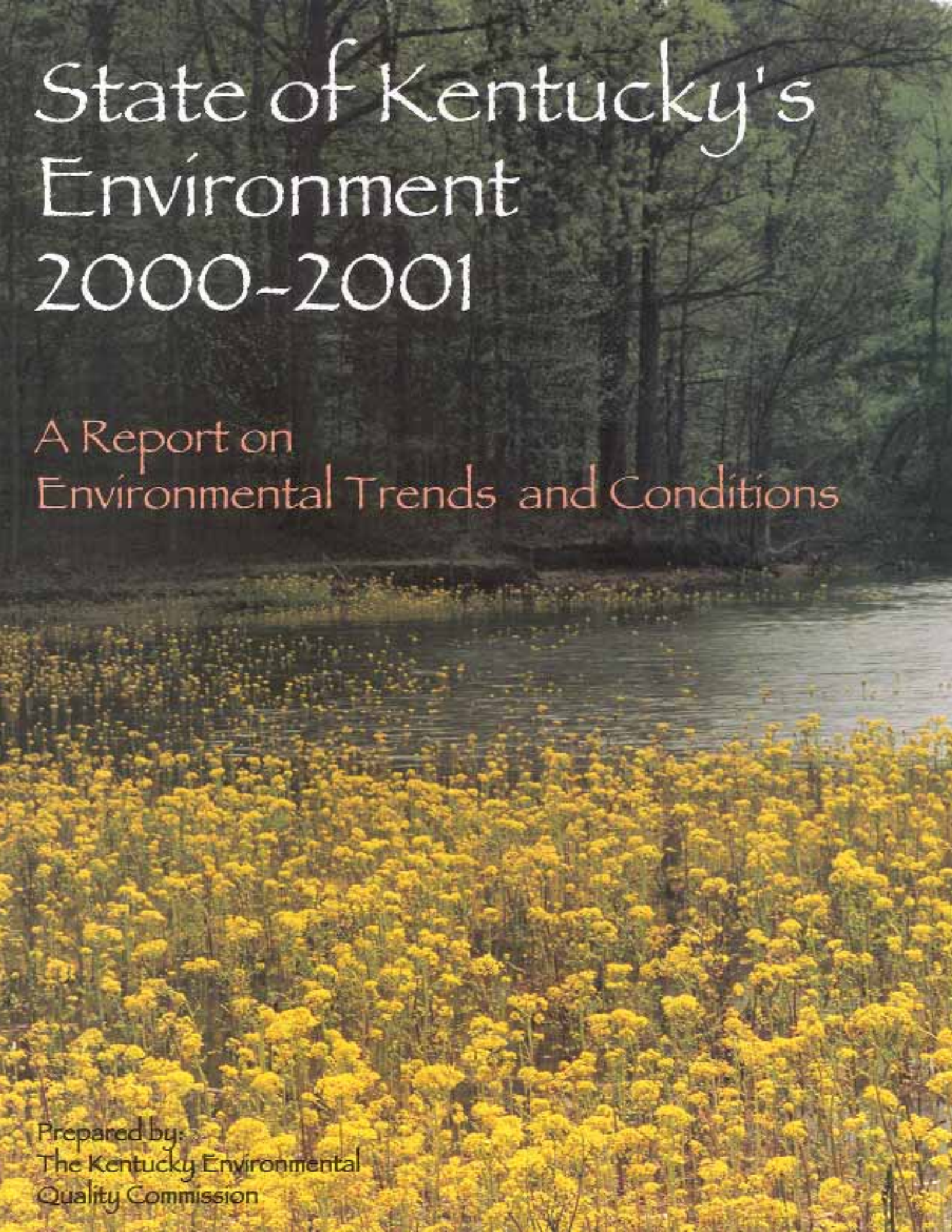
State of Kentucky's Environment 2000-2001

A Report on Environmental Trends and Conditions



Prepared by:
The Kentucky Environmental Quality Commission

2000-2001 State of Kentucky's Environment

A report on environmental trends and conditions

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June 2001

Published by:
The Kentucky Environmental Quality Commission
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Dear Fellow Kentuckians,

As I begin my tenth year as a member of the Kentucky Environmental Quality Commission, I have seen first hand the many environmental challenges confronting our great state. I have visited streams polluted by straight pipe sewage, toured open dumps scattered across the Commonwealth and heard Kentuckians express concerns about urban sprawl and unplanned growth. But I have also seen a state rally together to protect its highest peak–Black Mountain–and school children in Greenup County work hand in hand with a business to create a wildlife preserve.

What I have learned these past 10 years is that Kentuckians are a proud people that care deeply about the quality of their environment. I feel fortunate to serve on the Environmental Quality Commission and work with the other commissioners to increase public awareness, responsibility and positive action toward a clean and healthy environment.

It is in this light that I am pleased to present the commission's *2000-2001 State of Kentucky's Environment*. This report continues EQC's efforts to provide Kentuckians with useful information about the quality of our environment. The 2000-2001 State of Kentucky's Environment report includes information about the health of our water, air and land resources. EQC worked closely with many experts in the private and public sector to assess environmental and natural resource trends and conditions. Advisory committees composed of industry, environmental and university representatives provided valuable input as well. We also gathered public input from past State of Kentucky's Environment reader surveys to help improve the report.

It should become obvious in reading this report that a healthy and productive environment does not just simply happen. It takes work. Many challenges confronting the state will require all of us to do our part. Whether this is simply shutting off a light not in use to adopting a company-wide policy to conserve energy, adopting environmentally friendly routines and practices can truly help to protect our environment while conserving our natural resources.

We hope you find this report informative and will take a few minutes to fill out the reader survey form contained in the report. Or you can send it to us electronically by visiting our Web site at www.kyeqc.net. At our Web site you will also find a copy of the report as well as previous editions of the *State of Kentucky's Environment*.

Sincerely,

Aloma W. Dew

Aloma Williams Dew
Chair, Environmental Quality Commission

ACKNOWLEDGMENTS

The Environmental Quality Commission (EQC) was mandated in 1990 to assess environmental conditions and report these findings every two years. EQC published its first environmental trends report in 1992 with updates in 1994, 1996 and 1998. The *2000-2001 State of Kentucky's Environment* details trends in several areas including: drinking water, water quality, air quality, waste management, toxics, land use, forestry, farmland, biodiversity, coal mining, oil and gas drilling and energy. Each chapter includes indicators, charts and graphs containing data and information to measure trends and conditions and a general discussion of findings. Data in some charts have been refined and may differ from previous reports.

The report could not have been possible without the assistance of many who provided information, reviewed drafts and offered expertise. The Commission is especially grateful to the divisions and departments of the Kentucky Natural Resources and Environmental Protection Cabinet. EQC would also like to thank Kentucky Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources, Kentucky Department of Agriculture, Kentucky Agricultural Statistics Service, Kentucky Department for Economic Development, the Kentucky Coal Council, Kentucky Department for Public Health, Jefferson County Air Pollution Control District, Kentucky Tourism Development Cabinet, Kentucky Legislative Research Commission, Kentucky State Data Center, the Kentucky Pollution Prevention Center, cities of Lexington and Louisville, American Planning Association, U.S. Environmental Protection Agency, U.S. Forest Service, U.S. Department of Agriculture, U.S. Natural Resources Conservation Service and the Illinois State Water Survey for providing information used in the report. EQC is also grateful to Heather Frederick for her assistance with editing the report.

In addition, EQC extends its appreciation to members of the *State of Kentucky's Environment* Advisory Committee for providing valuable review of the report. EQC would also like to acknowledge Fred and Frances Kirchhoff who donated the scenic pictures displayed throughout the report.

A majority of the charts in this report were prepared by EQC using data provided by state agencies and other sources. The intent of this report is to provide a factual accounting of environmental conditions based on sound data. EQC acknowledges, however, that in some cases data may be incomplete, not collected consistently from year-to-year or based on samples or models. Therefore, EQC notes that while measuring environmental trends and conditions is an imperfect science, it is still a valuable tool from which to chart environmental progress in Kentucky.

EQC welcomes comments and corrections in order to refine information for future publications. Any findings or conclusions in this report are those of EQC.

2000-2001 State of Kentucky's Environment - Advisory Committee

Bari L. Joslyn, Northern Kentucky Water Service District
Kimberly Padgett, Kentucky Rural Community Assistance Program
Herman Cecil, Owensobro Municipal Utilities
Gary Larimore, Kentucky Rural Water Association
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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Photos Credits
All Photos courtesy of Fred and Frances Kirchhoff
Cover ..... Lake Barkley State Park
Chapter 1 ..... Pine Mountain State Park
Chapter 2 ..... Red River Gorge
Chapter 3 ..... Pine Mountain State Park
Chapter 4 ..... Pine Mountain State Park
Chapter 5 ..... Land Between the Lakes
Chapter 6 ..... Jim Scudder Nature Preserve
Chapter 7 ..... Red River Gorge
Chapter 8 ..... Lake Cumberland State Park

Chapter 1

Drinking Water

DRINKING WATER

PUBLIC DRINKING WATER SYSTEMS

Indicator 1. Public Drinking Water Systems

Background The federal Safe Drinking Water Act of 1974 and its amendments regulate the nation's public drinking water to ensure it is safe for consumption. An estimated 3,516,272 Kentuckians (87 percent) now have access to public drinking water provided by 656 public drinking water systems.[1] But access to public drinking water varies greatly by county. For example, only 37 percent of households in Knott County are served by public water systems, compared to 100 percent in Fayette County.[2]

About 90 percent of the water withdrawn for drinking is supplied by streams, lakes and reservoirs, with the remainder coming from groundwater sources. The five largest drinking water systems serve nearly one-third of all Kentuckians that have access to public water.

Pollutants can enter raw drinking water sources in a number of ways and come from a variety of sources. In Kentucky, polluted runoff from farmlands, coal mines and discharges from wastewater treatment plants are the greatest sources of water pollution.[3] Other pollution sources include failing septic systems, sewage straight pipes, waste sites, urban runoff, combined sewer overflows and toxic spills.

Goal Ensure public drinking water meets health based standards.

At a Glance

Number of Kentuckians served by public drinking water
2000. . . . . .3.5 million

Number of public drinking water systems
1993 840
2000. 656

Public drinking water systems with violations
1993 423
2000 316

Progress Kentucky assumed authority in 1977 from the U.S. Environmental Protection Agency (EPA) to implement the provisions of the Safe Drinking Water Act. During 2000, 48 percent of the 656 public drinking water systems permitted to operate in Kentucky had violations of Safe Drinking Water Act rules. A majority of the 871 violations cited in 2000 were for failure to properly monitor (49 percent) and failure to submit monthly operation reports (31 percent).

Thirteen percent of the 871 violations cited in 2000 were for failure to issue consumer confidence reports. Consumer confidence reports are required under federal and state law. By 2001, every customer served by a community water system should have access to a consumer confidence report that contains information about the system's source water and the quality of the drinking water.[4] These yearly reports detail violations of water quality standards and treatment rules.

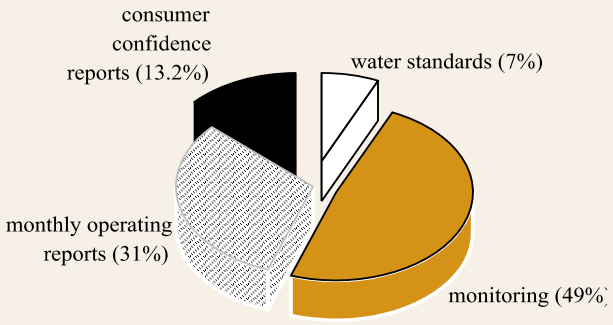
Seven percent of the violations cited in 2000 were for exceeding Maximum Contaminant Level (MCL) health-based drinking water standards. Forty-eight public drinking water systems had violations of MCL standards in 2000. Small public water systems remain the greatest violators of drinking water regulations. A small system is defined as serving fewer than 3,300 people. During 2000, 240 small systems accounted for 76 percent of the drinking water violations. Many small systems do

Measure 1. Public Drinking Water Systems and Violations Trends in Kentucky

Facility Size (Population Served)	Number of Systems*			Number of Systems w/Violations**			Number of Drinking Water Violations** (percent total)		
	1993	1997	2000	1993	1997	2000	1995	1997	2000
<100	220	168	126	130	68	70	733 (46%)	620 (47%)	322 (37%)
101-500	188	145	118	90	58	75	436 (27%)	227 (31%)	251 (29%)
501-1,000	65	55	46	19	19	24	80 (5%)	50 (7%)	45 (5%)
1,001-2,500	132	128	116	64	35	55	129 (8%)	72 (10%)	93 (11%)
2,501-3,300	46	45	34	30	9	16	59 (4%)	14 (2%)	27 (3%)
3,301-5,000	47	47	55	23	13	22	50 (3%)	13 (2%)	45 (5%)
5,001-10,000	80	80	81	41	24	31	80 (5%)	39 (5%)	55 (6%)
10,001-50,000	57	57	75	25	15	22	35 (2%)	20 (3%)	31 (4%)
50,001-100,000	3	3	1	1	1	1	1(<1%)	1 (<1%)	2 (<1%)
>100,000	2	2	4	0	2	0	0 (0%)	4 (<1%)	0 (0%)
Total	**840**	**730**	**656**	**423**	**239**	**316**	**1,603**	**729**	**871**

Public Drinking Water Systems

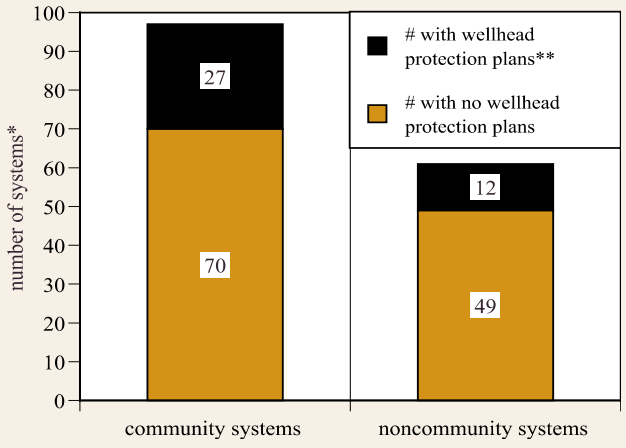
Measure 2. Types of Public Drinking Water Violations in Kentucky (2000)



Measure 3. Public Drinking Water Systems in Significant Noncompliance (2000)

Water System	County	Population Served
Kettle Island Water System	Bell	396
Shouses Mobile Home Park	Breathitt	35
Blue Diamond Camp	Harlan	59
Total 3		**490**

Measure 4. Drinking Water Systems with Wellhead Protection Programs in Kentucky



not have the expertise, equipment or resources to meet various requirements of the Safe Drinking Water Act. The Kentucky Division of Water has encouraged mergers of small nonviable systems in an effort to improve drinking water quality. Between 1979 and 2000, 555 drinking water system mergers have occurred. Mergers have eliminated a number of poorly operated drinking water plants. For example, during 2000, only three public water systems serving a total of 490 people were in significant noncompliance with drinking water rules, compared to 13 systems in 1997.

As a result of the Safe Drinking Water Act Amendments of 1996, all states are required to develop a Source Water Assessment Program (SWAP). A key component of Kentucky's SWAP is an assessment of a water source's susceptibility to contamination. Currently, 97 community systems (those systems that serve customers year round) depend on groundwater for public drinking supplies. To date, 27 community drinking water systems have wellhead protection plans.

There are also 61 noncommunity systems that rely on groundwater for drinking water supplies. Noncommunity systems are defined as serving the same people at least 6 months of the year and typically include industries, schools and state parks. Currently, 12 of these systems have developed wellhead protection plans to protect groundwater supplies. All groundwater dependent public water systems will be required to complete wellhead protection plans by May 2003.

Footnotes

1. As estimated by Ky. Division of Water, Drinking Water Branch by multiplying the number of service connections for community public drinking water systems by a factor of 2.6 persons per household (1990 Census).
2. Ibid.
3. 1998 and 2000 305b Report, Ky. Division of Water.
4. U.S. EPA Safe Drinking Water Goals for 2005, U.S. EPA, December 1999.

Measures - notes and sources

***Measure 1**. *Includes public community, noncommunity and nontransient systems. **Includes violations of drinking water standards (MCLs), monitoring and reporting violations. Includes Phase II and V chemical testing but not bottled water facilities. Percents rounded. Source: Ky. Division of Water.*
***Measure 2.** Based on 871 violations. Includes Phase II and V chemical testing results. Source: Ky. Division of Water.*
***Measure 3**. Includes community water systems with monitoring, reporting and MCL violations. Significant noncompliance are systems with 12 or more monitoring or MCL violations in any 12-month period. Source: Ky. Division of Water.*
***Measure 4**. Based on systems dependent on groundwater as a drinking water source. *Plans approved or under development. Source: Ky. Division of Water.*

DRINKING WATER

PUBLIC DRINKING WATER QUALITY

Indicator 2. Public Drinking Water Quality

Background While public drinking water in the United States is considered among the safest in the world, its safety cannot be taken for granted. Violations of Safe Drinking Water Act standards continue to occur in Kentucky and pose risks to public health. Most violations occur at smaller drinking water facilities. The most common drinking water contaminants detected in Kentucky are bacteria (an indication water may be contaminated with fecal matter); turbidity or cloudiness (which can interfere with the treatment process and allow pathogens to survive); trihalomethanes (organic chemicals created during the disinfection of water with chlorine); and inorganic chemicals (which include nitrates, mercury and barium).

Goal Ensure public drinking water can be safely consumed by meeting Safe Drinking Water Act rules and regulations that specify 103 health-based Maximum Contaminant Levels (MCLs).

Progress Trends reveal that violations of drinking water health-based MCL standards have been declining significantly during the past 15 years in Kentucky. Of the 656 public drinking water systems operating in the state, 4 percent, or 30 systems, had violations of MCLs during 2000. The MCL violations in 2000 included the following contaminants: bacteriological (10), turbidity (16) and trihalomethanes (22).

There are several facilities that are persistent violators of MCL standards. During 2000, an estimated 8,713 Kentuckians were at risk from 15 public drinking water systems with persistent violations of bacteria and turbidity standards. This is a significant improvement since 1997 when 27 systems serving 38,799 customers were considered persistent violators of bacteria and turbidity standards.

A majority of violations cited at drinking water plants are resolved; however, some result in fines. During 2000, three public drinking water systems were fined a total of $4,000.

Kentucky periodically conducts testing for various organic and inorganic chemicals as required by federal and state law. The most recent round of testing conducted between 1996 and 1998 found 63 violations of drinking water standards, a majority of which were for inorganic chemicals. The more common pollutants detected included naturally occurring chemicals such as nitrates, barium and cadmium; trihalomethanes, a disinfection by-product; pesticides such as atrazine, simazine, metolachlor and bromomethane; and chemical solvents including dibromomethane, xylene, trichloroethylene and tetrachloroethylene.

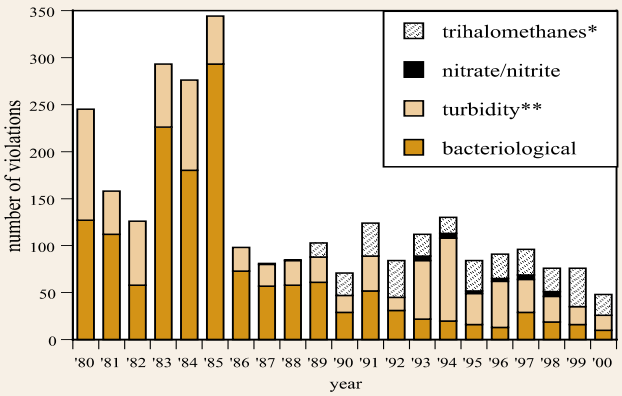
In January 2001, the U.S. EPA published a new standard for arsenic in drinking water that requires public water supplies to reduce arsenic to 10 parts per billion (ppb) by 2006. The new standard was based on a report by the National Academy of Sciences that concluded the current standard does not adequately protect public health. Arsenic in water has been linked to bladder, lung and skin cancer and may cause kidney and liver cancer, birth defects and reproductive problems. Arsenic also harms the central nervous

At a Glance

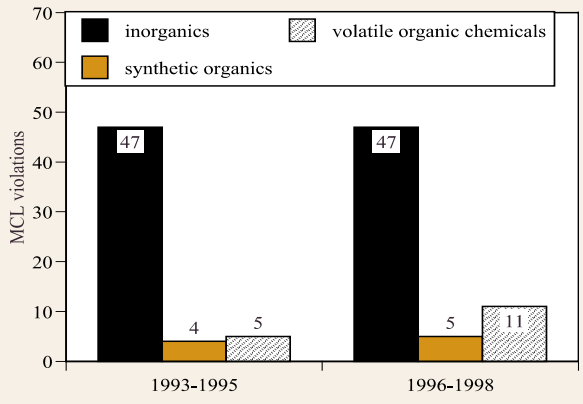
Violations of drinking water MCL standards
1995 84
1999 48

Number of systems with MCL violations
1995 39
2000 30

Measure 1. Public Drinking Water Standard Violations in Kentucky

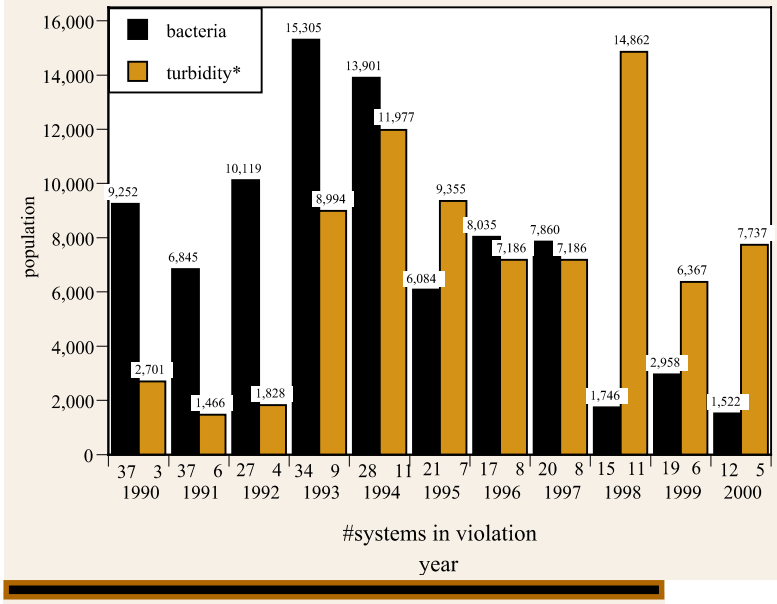


Measure 2. Public Drinking Water Standard Violations in Kentucky (Phase II and V Contaminants)



Public Drinking Water Quality

Measure 3. Population Served by Public Water Systems in Kentucky with Persistent Violations



Measure 5. Drinking Water Fines in Kentucky

Year	#Systems	$Fines*
1990	11	$41,585
1991	18	$59,950
1992	28	$69,825
1993	22	$71,125
1994	31	$62,300
1995	24	$44,375
1996	19	$66,850
1997	10	$16,950
1998	15	$33,600
1999	10	$29,700
2000	3	$4,000

Measure 4. Persistent Water System Violators of Safe Drinking Water Act Standards (2000)

Water System	County	Population Served
Kettle Island Water System*	Bell	396
Hillside Trailer Park	Boone	150
Shouses Mobile Home Park	Breathitt	35
Oakdale Christian H.S.	Breathitt	60
Shady Oak Trailer Park	Calloway	277
Dogwood Resort	Calloway	130
Kentucky Beach Resort	Calloway	85
Cumberland Co. Water District	Cumberland	5,200
Knott Co. Water District	Knott	283
Evarts Municipal	Harlan	1,708
Blue Diamond Camp*	Harlan	59
Jackhorn Water Supply*	Letcher	200
Bills Place	Owen	40
Fairview Grocery	Owen	40
Front Porch Store	Perry	50
Total 15		**8,713**

system and heart. Testing in Kentucky detected arsenic in 150 of the 239 public water systems sampled, with 15 having detections exceeding the proposed arsenic 10 ppb MCL in finished water. Two systems had more than one sample exceeding the proposed arsenic standard. The U.S. EPA is now reviewing this standard to ensure it is based on sound science and accurate cost estimates.[1] Approximately 90 percent of industrial arsenic in the U.S. is currently used as a wood preservative.[2] Agricultural applications, mining and smelting also contribute to arsenic releases in the environment.

Footnotes

1. "EPA Administrator Whitman Establishes Process to Evaluate Arsenic in Drinking Water Standard," U.S. EPA press release, April 18, 2001.

2. Drinking Water Standard for Arsenic, U.S. EPA , 815-F-00-015, January 2001.

Measures - notes and sources

***Measure 1**. Based on violations of Maximum Contaminant Levels (MCLs). *Trihalomethane monitoring not required prior to 1989. **More stringent turbidity standards took effect in 1993. Does not include monitoring and reporting violations for Phase II and V contaminants. Source: Ky. Division of Water.*

***Measure 2**. Based on Phase II and V testing. Source: Ky. Division of Water.*

***Measure 3**. Persistent violators are systems with four or more monitoring or MCL violations in any 12-month period. *More stringent turbidity standards took effect in 1993. Source: Ky. Division of Water.*

***Measure 4**. As of December 2000. Persistent violators are systems with four or more monitoring or MCL violations in any 12-month period for bacteria and/or turbidity. Some systems have both turbidity and bacterial violations. *Indicates system was also reported in violation in EQC 1998 report. Source: Ky. Division of Water.*

***Measure 5**. *Includes total civil and performance penalties assessed by calendar year. Source: Ky. Division of Water.*

DRINKING WATER

NOTICES AND ADVISORIES

Indicator 3. Boil Water Notices and Advisories

Background The number of boil water advisories has risen dramatically in Kentucky. The increase is likely due to increased awareness on the part of public water systems to issue advisories when the potential for contamination occurs, most often during waterline breaks. In many areas, drinking water distribution systems have not been maintained, resulting in deterioration, leakage and failure. Some water systems in Kentucky lose as much as 50 percent of their treated water due to leaks and waterline breaks, according to reports filed with the Kentucky Public Service Commission. Deteriorating pipes not only can cause water loss, but can allow the infiltration of contaminants during pressure losses. Extended periods where the temperature is below freezing are also a major cause of line breaks.

At a Glance

Number of boil water advisories/notices
1990. 52
1995. 91
2000. 556

Goal Ensure public drinking water can be safely consumed by ensuring that boil water advisories and notices are promptly issued.

Progress During 2000, there were 546 boil water advisories (issued when there is a potential for contamination) and 10 boil water notices (issued when bacteriological contamination is confirmed). This was a decrease from 1999, but still a dramatic increase as compared to earlier years. The Kentucky Division of Water generally attributes the rise to better education and awareness of water system operators to report potential contamination problems as well as more consistent reporting of waterline breaks. The number of consumer advisories has declined from a high of 14 in 1995 to one in 2000. The consumer advisory in 2000 was for potential contamination as a result of a broken water line near a gas station in Hindman, Ky.

During 2000, Pineville Water System led the state in notices/advisories with 53, followed by West Laurel Water Association (40), Olive Hill Municipal Water Works (33), Rattlesnake Ridge Water District (33) and Grayson Utility Commission (31).

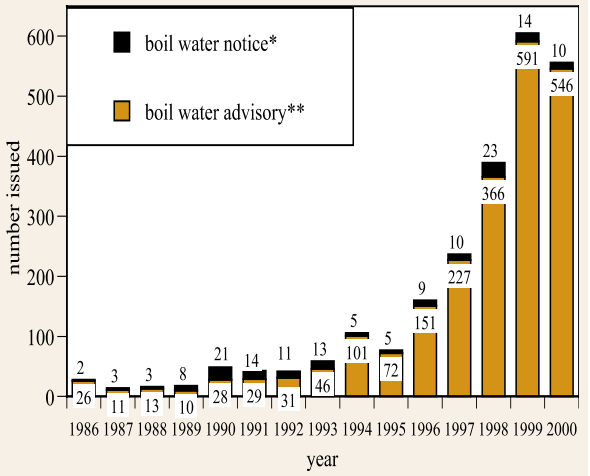
Boil water notices and advisories typically last a few days. However, some communities have experienced long-term advisories. For example, Evarts in Harlan County has had a number of boil water advisories since 1994 due to turbidity problems. In August 1998, the city declared an emergency in order to be eligible for federal funding to resolve problems at the drinking water plant. Emergency funding was obtained to replace the finished water storage tank which was in imminent danger of failure. Bandana Water System in Ballard County has also been on a long-term consumer advisory for nitrate contamination of its groundwater source caused by runoff of agricultural chemicals. New wells were drilled in 1999 and 2000 and nitrate values are now within the MCL standard.

Measures - notes and sources

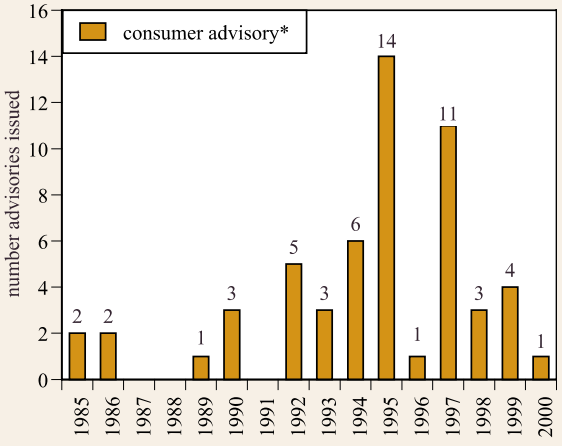
Measure 1. **Issued when there is potential for bacteriological contamination. **Issued when evidence shows bacteriological contamination. Source: Ky. Division of Water.*

Measure 2. **Issued when adverse health effects from consumption of water are possible or when other information of interest to consumer exists. Source: Ky. Division of Water.*

Measure 1. Boil Water Advisories and Notices in Kentucky



Measure 2. Consumer Advisories in Kentucky



Private Drinking Water

Indicator 4. Private Drinking Water Wells

At a Glance

Number of Kentuckians dependent of water wells, cisterns and springs for drinking 2000. 541,000

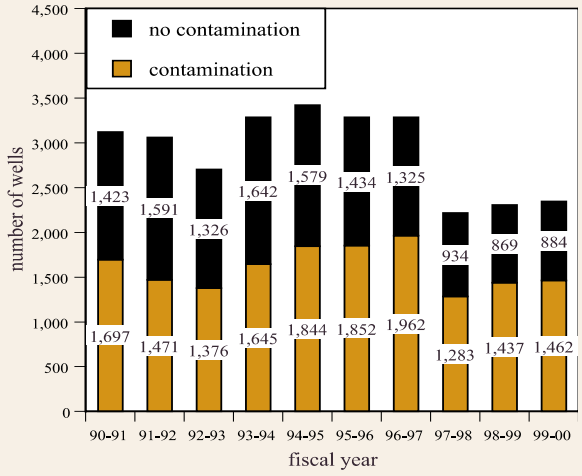
Testing of private wells (2000)
sampled. 2,346
contaminated. .1,462

Background An estimated 541,000 Kentuckians rely on private wells, springs or cisterns for drinking water, according to the Kentucky Division of Water. Households that depend on water wells are most numerous in eastern Kentucky and the far western portion of the state. In Kentucky and many other states, private drinking water sources are not required to be monitored for contamination, so it is not possible to determine the overall quality of this resource.

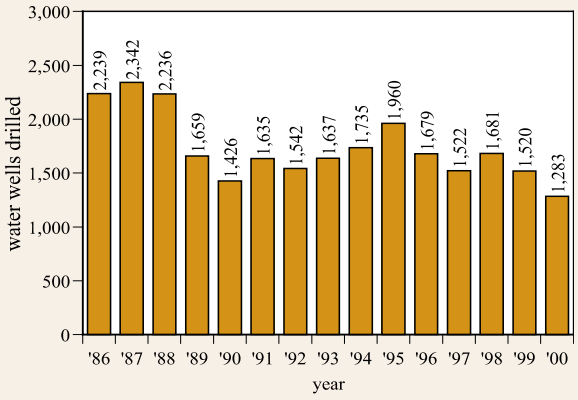
Groundwater has many potential sources of contamination. These include leaking underground storage tanks, raw sewage from failing septic systems, straight pipes and agricultural operations. Because more than half of Kentucky is underlain with karst topography, surface water and groundwater often mix, increasing the likelihood of groundwater contamination. Hand-dug and improperly constructed water wells are more susceptible to contamination.

Goal Ensure drinking water from private wells can be safely consumed by ensuring proper well construction and maintenance.

Measure 1. Voluntary Testing of Private Drinking Water Wells for Bacteria



Measure 2. Number of Domestic Water Wells Reported Drilled In Kentucky



Progress A review of individual water wells tested by local health departments upon request reveals 62 percent of the 2,346 water wells sampled during fiscal year 1999-2000, tested positive for total coliform bacteria—an indication the water may be contaminated. Contamination detected in water wells may not necessarily indicate the groundwater source is polluted but might be caused by pollution seeping or running off into the well from nearby septic tanks or other land use activities. Contamination of well water can also be the result of poor well construction and maintenance or problems with home distribution systems. According to state health officials, many private water wells are not routinely tested or properly maintained.

Kentucky has made progress in ensuring the safe construction of water wells in order to prevent contamination. Since 1985, state regulations have required all water well drillers to be certified. Currently, 106 drillers are certified in Kentucky. During fiscal year 1999-00, 3,117 new water wells were drilled in the state, according to state water well records. Of these 1,283 were for drinking.

Measures - notes and sources

Measure 1*. Tests of private wells for total coliform bacteria. Tests are requested by well owners. Source: Ky. Department for Public Health.*

Measure 2. *Source: Ky. Division of Water.*

DRINKING WATER

DRINKING WATER INFRASTRUCTURE

Indicator 5. Public Drinking Water Infrastructure

Background An estimated 3.5 million Kentuckians (87 percent of the Commonwealth's population) now have access to water from 656 public drinking water systems.[1] The remaining 541,000 Kentuckians rely on private water wells, cisterns, hauled water or other sources for drinking water.

An estimated $2.8 billion will be needed during the next 20 years to expand, upgrade and replace drinking water infrastructure as well as meet the requirements of the Safe Drinking Water Act, based on locally identified needs.[2] In 1999, the average Kentuckian used 65 gallons of water a day and paid $20 a month for public drinking water.[3]

Goal Improve and maintain drinking water infrastructure, develop a statewide strategic plan designed to ensure every household in Kentucky has access to potable water by 2020, and require water suppliers to develop long-range water supply plans by July 15, 1999.

At a Glance

Estimated drinking water infrastructure 20-year needs . . . . . .$2.8 billion

State drinking water revolving loan fund number projects 15
loans. . . $22.16 million

Number of counties with state approved long-range water supply plans 120

Progress In 1996, Congress amended the Safe Drinking water Act to provide states with $9.6 billion to help communities finance drinking water improvements. Kentucky was allocated $12.55 million in 1997, $10.85 million in 1998, $11.37 million in 1999 and $ 11.82 million in 2000 to set up a low interest state revolving loan fund to finance drinking water infrastructure and repairs. As of March 1, 2001, the state's Drinking Water Revolving Loan Fund, managed by the Kentucky Infrastructure Authority (KIA), has approved 15 drinking water projects valued at $22.16 million. There are seven additional projects for a total of $22 million in loans currently under review.

In 2000, the General Assembly expanded the role of the KIA to support drinking water infrastructure planning and development; promote higher levels of technical, managerial, and financial capacity of water-based utilities; and provide for investor-owned, private utilities. A new program, the 2020 Fund, was also added to KIA's grant and subsidized loan programs. The 2001-2002 state budget authorized $50 million in bond proceeds to finance the 2020 Fund for use as grants and/or low interest loans for water resource development. Funds can also be used to provide incentives to support improved planning and management of water infrastructure across the Commonwealth.

Kentucky also continues to make headway in planning for long-range water supply needs. The state's Water Supply Planning Program was created after the 1988 drought when many communities in the Commonwealth experienced drinking water supply shortages. In 1990, the General Assembly mandated long-range water supply plans be developed by every county by July 15, 1998 (later extended to July 15, 1999). All counties and/or water suppliers have received final state approval of their water supply plans.

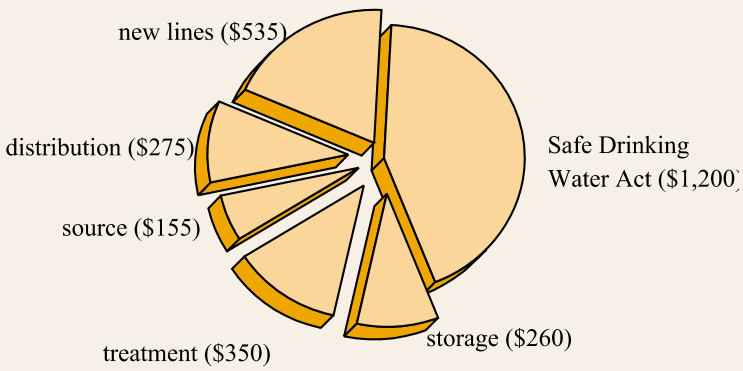
Footnotes

1. Ky. Division of Water.
2. Water-Resource Development: A Strategic Plan, Draft, Water Resources Development Commission, October 1999.
3. Ibid.

Measures - notes and sources

***Measure 1**. Based on locally identified needs. Source: Water Resource Development Commission, 1999.*

Measure 1. Estimated Drinking Water Infrastructure Investment Needs in Kentucky (in millions of dollars)



Chapter 2

Water Resources

WATER RESOURCES

RIVERS AND STREAMS

Indicator 1. Water Quality of Rivers and Streams

Background Kentuckians enjoy the benefits of an estimated 89,431 miles of rivers and streams. The quality of these waterways varies from severely degraded to clean enough for swimming, fishing or use as a drinking water source. The Kentucky Division of Water maintains a network of ambient water quality stations throughout the state to monitor water quality.[1] In 1997, 1998 and 1999, these stations monitored 8.4 percent of the 89,431 stream and river miles for 32 different parameters. While this data may not represent a statistically valid sample of water quality statewide, it does provide a general indicator of water quality in Kentucky.

Agricultural activities are the leading source of water pollution in monitored waterways based on the most recent and available monitoring data. Contaminated runoff containing agricultural nutrients and chemicals is impacting 25 percent of the monitored impaired stream miles. Resource extraction (coal mining and petroleum activities), follows impacting 15 percent of the miles impaired, while sewage treatment plants are impairing 13 percent of the monitored waterways.

Disease-carrying pathogens, often associated with untreated or poorly treated animal and human waste, remain the principal pollutant, impairing 31 percent of the stream miles monitored. In 1999, the state declared that 234 miles of Kentucky's rivers and streams were too polluted for swimming because of high levels of fecal coliform bacteria

Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Progress State, local and private sector efforts to restore water quality have been ongoing since the passage of the federal Clean Water Act in 1972. During the past 25 years, progress has been made in improving water quality in the state. For example, in 1972, 71 percent of the waterways could not fully support their designated uses, compared to 34 percent in 1997-1999.

At a Glance

River and stream miles. 89,431

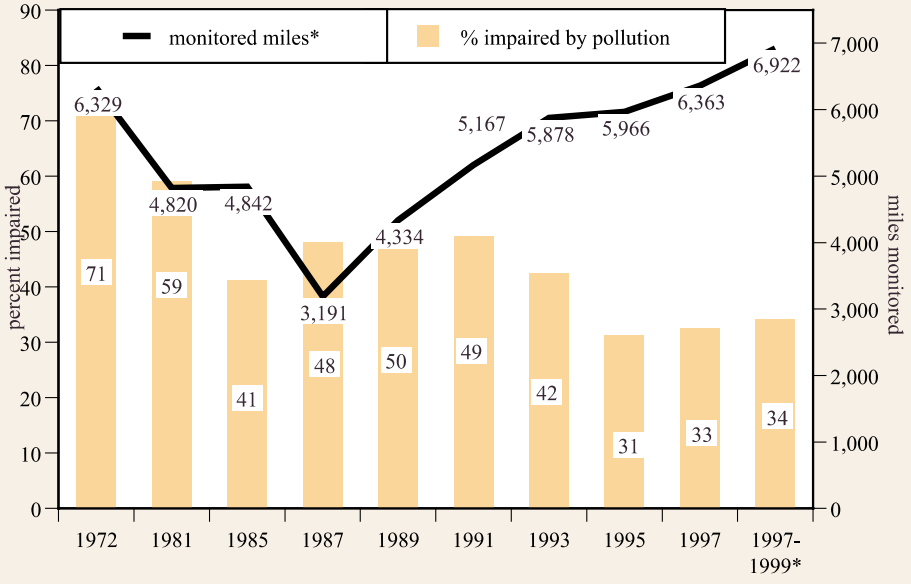
River and stream miles monitored 6,992

Percent of monitored waterways impaired
1972 . . . . . 71%
1989 . . . . . .50%
1995 . . . . . .31%
1997-99. . . . . .34%

Leading sources of water pollution
agriculture 25%
resource extraction 15%
sewage 13%

Leading causes of water pollution
pathogens 31%
siltation 21%
nutrients 10%

Measure 1. Percent of Kentucky Waterways Impaired by Pollution



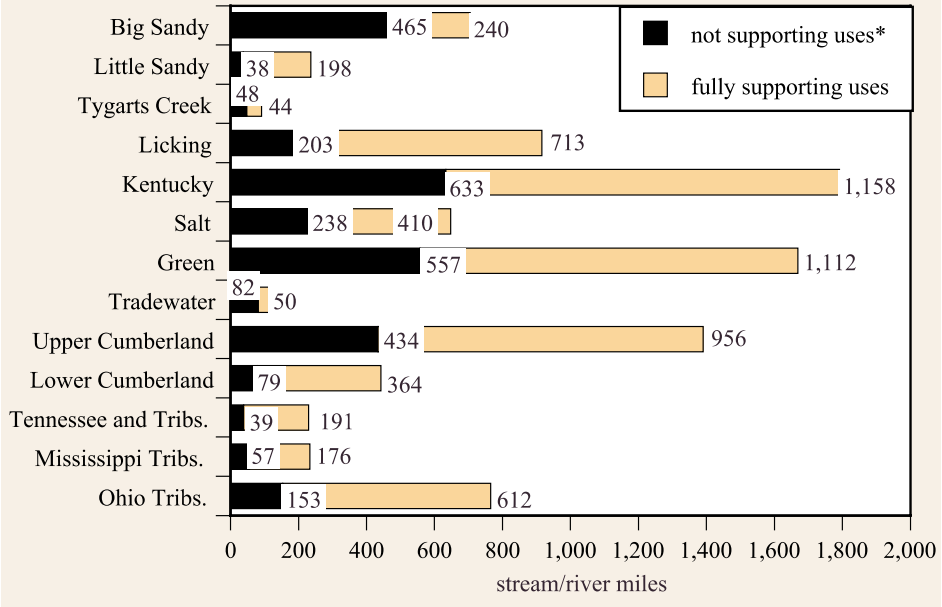
Rivers and Streams

However, trends reveal less progress in restoring water quality in recent years. Since 1995, the percent of impaired waterways has reversed its downward trend and has leveled out. The state is now conducting intensive monitoring on a watershed by watershed basis. This monitoring data may provide a more complete picture of water quality in Kentucky. Each of the state's 11 river basins will be monitored extensively every five years. The intent is to gain a better understanding of overall conditions and pollutants impairing various watersheds, target problems, design effective solutions, and measure success through monitoring and data gathering. Watershed management activities are currently underway in the Kentucky River, Cumberland River and Salt River basins.[2] Intensive monitoring in the Kentucky River Basin during 1998 and 1999 revealed that one-third of the 1,791 miles assessed could not support uses due to pollution.

The Kentucky Division of Water is also required to establish "Total Maximum Daily Loads" or TMDLs for 196 stream segments and 34 lakes that do not meet state water quality standards. In the TMDL process, state and local interests work together to allocate pollution reduction loads among sources and determine the best way to address the specific problems of a particular waterbody. To date, the Division of Water has completed TMDLs on 30 waterways.

Efforts to control pollution from agricultural operations continue. The Kentucky Agriculture Water Quality Act, passed in 1994, requires all farms that are greater than 10 acres in size and that meet the definition of an agricultural operation to develop and implement water quality plans to protect water quality and prevent pollution. To date, 32,592 agriculture operations (36 percent of the state's 91,000 farms) have voluntarily filed plans with state conservation districts.

Measure 2. Stream and River Miles Impaired by Pollution by River Basin (1997-99)

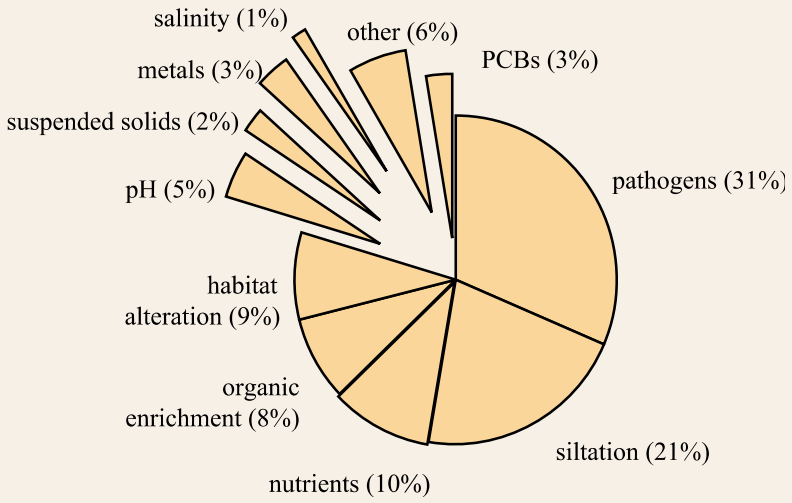


Footnotes

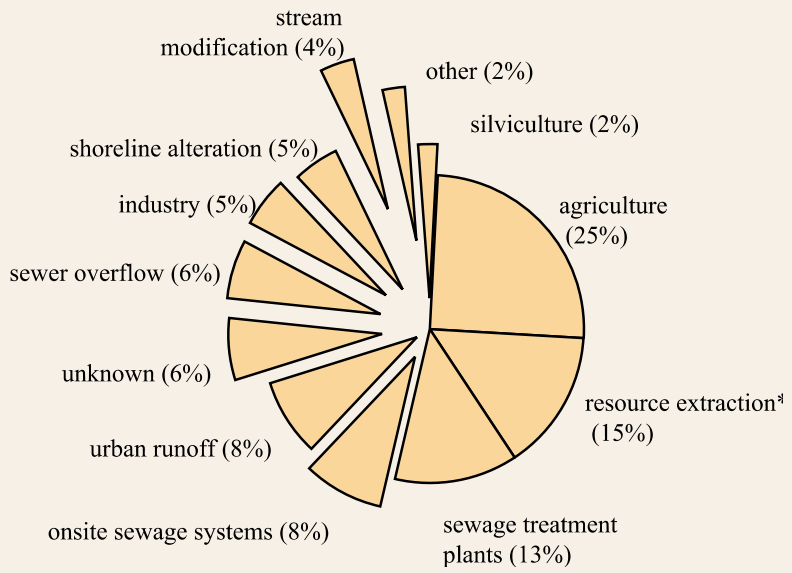
1. There were 44 fixed, statewide stations in the pre-watershed initiative ambient water quality sampling network prior to 1998. This network was increased to 71 in 1998 and was then also supplemented by approximately 25 rotating watershed stations. Most of the 44 (and now 71) stations are located at the downstream end and mid-unit in 8-digit hydrologic units and the downstream end of major tributaries. Their purpose was and is to characterize the water quality of the major watersheds in the state, including long-term trends.

2. More information about the Watershed Framework and TMDL development is available by visiting the Ky. Division of Water's Web site at http://water.nr.state.ky.us/dow/watrshd.htm.

Measure 3. Causes of Stream and River Pollution in Kentucky (1997-99)



Measure 4. Sources of Stream and River Pollution in Kentucky (1997-99)



Measures - notes and sources

***Measure 1**. 1972-1981 data include river and stream miles monitored and evaluated. 1982-1999 based on monitored river and stream miles. Ohio River monitoring data collected by ORSANCO not included. During 1998-99, the Division of Water only monitored waterways in the Kentucky River Basin. *Percent based on 1998-99 monitoring data for the Kentucky River Basin and 1997 monitoring data for the other river basins in Kentucky. Source: Ky. Division of Water.*

***Measure 2**. Based on monitored and evaluated waterways. 1998-99 monitoring data only collected for the Kentucky River. Remaining river basins based on 1997 monitoring data. *Miles not supporting or partially supporting one or more uses (swimming, fishing, drinking water). Source: Ky. Division of Water.*

***Measure 3**. Based on monitored miles. Ohio River monitoring data collected by ORSANCO not included. In 1999 the Division of Water only monitored waterways in the Kentucky River Basin. *Percent based on 1998-99 monitoring data for the Kentucky River Basin and 1997 monitoring data for the other river basins. Source: Ky. Division of Water.*

***Measure 4**. Based on monitored miles. Sources are determined from the data available in geographic information system overlays, including aerial photos and topographic maps of land cover and use, point source discharges and monitoring data, locations of sources and other features that may affect the waters and filed observations. Ohio River monitoring data collected by ORSANCO not included in this chart. In 1998-99, the Division of Water only monitored waterways in the Kentucky River Basin. Percent based on 1998-99 monitoring data for the Kentucky River Basin and 1997 monitoring data for the other river basins. *Water pollution from resource extraction activities (petroleum and coal mining). Known sources include 366 miles impaired by coal mining and 33.7 miles impaired by petroleum activities. Coal mining impacts include: surface mining (122 miles), subsurface mining (65 miles), acid mine drainage (90.3 miles), abandoned mining (43.1 miles) and inactive mining (45.6 miles). Source: Ky. Division of Water.*

Lakes

At a Glance

Number of public lakes 2,271

Number of lakes monitored 106
impaired by pollution 40

Leading sources of lake pollution
agriculture 23%
natural 19%
coal mining 10%

Leading causes of lake pollution
nutrients 60%
organic enrichment.30%
pH. 7%

Indicator 2. Water Quality of Lakes

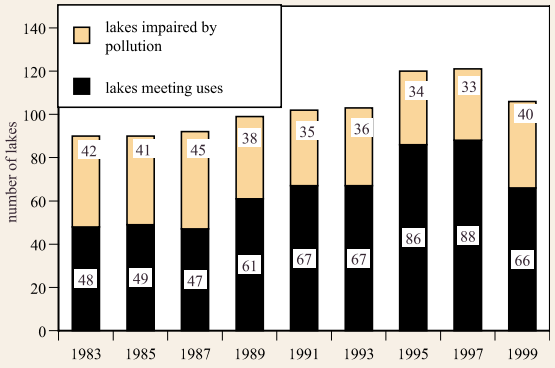
Background Thousands of lakes provide Kentuckians with recreational and economic benefits and supply a number communities with primary and secondary sources of drinking water. The Kentucky Division of Water estimates there are 2,271 lakes in the state, of which 953 are greater than 10 acres in size.

The Kentucky Division of Water monitors most publicly owned lakes every five to seven years. Publicly owned lakes are owned or managed by a city, county, state or federal agency. During 1999, the number of lakes monitored declined by 15 because these domestic water supply lakes were sampled only once in 1997 as part of the state's drinking water program and are not part of the normal lakes monitoring program.

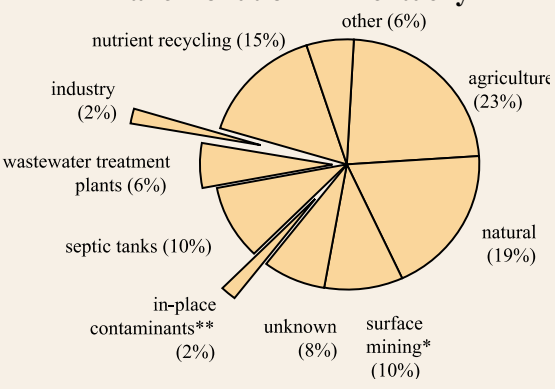
The principal pollutants impairing lake water quality are pesticides and nutrients. Agriculture remains the leading source of lake pollution in Kentucky, polluting 17 of the 40 lakes impaired. Natural conditions, such as shallow lake basins, are impairing the water quality of 10 lakes, followed by nutrient recycling with eight impaired lakes, and coal mining causing five lakes not to meet their designated uses.

Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Measure 1. Public Lakes in Kentucky Impaired by Pollution



Measure 2. Sources of Lake Pollution in Kentucky



Progress During the past several years, trends reveal general improvement in the number of monitored public lakes meeting their designated uses for swimming, fishing or as a drinking water source. However, in 1999, Kentucky lost ground. Seven lakes were added to the list of impaired waterways, bringing the total up to 40. One of three public lakes assessed during 1999 was impaired by pollution.

One explanation for the rise in lake pollution may be the drought of 1998 and 1999. The lack of rainfall affected water quality of several lakes resulting in higher water temperature, less aeration, and more extensive phytoplankton communities and blue-green algae. The algae blooms are evident as green coloration of the water and mats of "scum" in mid- to late summer. The eventual die-off of these blooms can also cause low dissolved oxygen levels as bacteria consume oxygen to break down the decaying organic matter. Low dissolved oxygen levels stress fish and other aquatic life and can result in fish kills. Lakes in the Salt and Licking River watersheds were severely impacted by the drought.

But water quality improvements were seen at Reformatory Lake in Oldham County. This lake has been routinely listed as not supporting uses since 1980. The lack of rainfall prevented feedlot nutrients and agriculture runoff pollution from a nearby prison farm from entering the lake, thus improving water quality conditions.

Measures - notes and sources

***Measure 1**. Source: Ky. Division of Water.*

***Measure 2**. Based on 40 public lakes assessed not fully meeting or only partially meeting tier designated uses due to pollution. Some lakes have multiple sources of pollution which are reflected in this chart. *Active, inactive and abandoned coal mines. **Chemicals (PCBs, metals) of unknown origin found in sediment. Source: Ky. Division of Water.*

Indicator 3. Groundwater Quality

Background Groundwater is a valuable resource in Kentucky. During 1999, public water systems (those permitted to withdraw 100,000 gallons per day or more) withdrew 67 million gallons of groundwater a day to meet drinking water needs. Thousands of Kentuckians also depend on groundwater for private drinking water supplies. Since 1990, 17,620 domestic drinking water wells have been reported drilled in Kentucky. Private water wells are most numerous in eastern Kentucky and in far western Kentucky, where 65 percent of all new wells have been constructed in the state. In addition, millions of gallons of groundwater are withdrawn by businesses, industries and farmers to meet their water supply needs. Groundwater also contributes significantly to surface water flow and quality.

The Kentucky Division of Water considers groundwater quality generally good in Kentucky. However, groundwater pollution incidents have been reported in almost every county of the Commonwealth. Impacts on groundwater quality occur more frequently in the most environmentally sensitive karst areas of the state and from a range of activities including spills, leaking underground storage tanks, waste sites, agriculture runoff and untreated sewage. Groundwater contamination is often difficult, and sometimes impossible, to clean up.

Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Progress The Kentucky Division of Water established a statewide Ambient Groundwater Monitoring Program in 1995. The network was created to generally determine the quality of groundwater in Kentucky. To date, more than 260 wells and springs have been sampled, ranging from six times a year to one-time-only sampling. Samples are analyzed for more than 200 chemical and physical parameters including nutrients, total and dissolved metals, major inorganic ions, residues, volatile organic compounds and several pesticides, including atrazine, alachlor, metolachlor, simazine and cyanazine.

Various pesticides have been detected in springs and wells sampled in the Ambient Groundwater Monitoring Network. For example, atrazine, a commonly used herbicide in corn production, has been detected in 31 percent of springs sampled, with 1.34 percent exceeding the drinking water standard. Atrazine has also been detected in 7.4 percent of well samples, with 2.8 percent exceeding the drinking water standard.

Some of the chemicals detected in groundwater are naturally occurring. For example, fluoride is an element naturally found in water, soil, minerals, vegetation and foods. It is also found in the human body in structures such as bone and teeth. It has been shown that in communities where fluoride is naturally occurring in the water supply can make teeth stronger and more resistant to tooth decay. However, at high levels fluoride can have a detrimental effect resulting in bone disease, including pain and tenderness of the bones. The U.S. EPA has set an enforceable drinking water standard for fluoride of 4 milligram per liter. In Kentucky, less than 1 percent of the wells and springs tested had fluoride levels above the drinking water standard.

Nitrates also occur naturally through the decomposition of organic matter in soil. Nitrates and nitrites are also major constituents of

Measure 1. Sources of Groundwater Contamination in Kentucky

- Animal Feedlots
- Fertilizer Applications
- Landfills
- Mining and Mine Drainage
- Pesticide Applications
- Septic Systems
- Spills
- Underground Storage Tanks
- Urban Runoff

At a Glance

Withdraw of groundwater for public drinking water (1999)
. . 67 million gallons/day

Number of drinking water wells drilled in Kentucky
1990-1999 17,620

Number of springs and wells in groundwater monitoring network. 260

Percent of springs sampled with detects above standards
metolachlor. 5.44%
benzene 2.30%
atrazine 1.34%
nitrates 0.34%
fluoride 0.12%

Percent of wells sampled with detects above standards
nitrates. 4.30%
atrazine 2.80%
fluoride 0.90%
metolachlor 0.88%

Measure 2. Ambient Groundwater Well Testing Program in Kentucky (Selected Parameters)

Parameter	number sites	number samples	percent detects	percent detects above HCL/MCL*
Alachlor				
springs	65	839	4.60%	2.14%
wells	110	451	1.50%	0.66%
Atrazine				
springs	65	1041	32.70%	1.34%
wells	110	589	7.40%	2.80%
Metolachlor				
springs	68	840	18.70%	5.44%
wells	110	451	3.30%	0.88%
Nitrate-N				
springs	67	866	98.10%	0.34%
wells	111	434	84.70%	4.30%
Arsenic**				
public water systems	239	1,249	7.30%	6.2%
Simazine				
springs	64	885	4.90%	1.24%
wells	110	501	0.79%	0
Fluoride				
springs	68	820	99.00%	0.12%
wells	111	443	98.60%	0.90%
Benzene				
springs	21	86	9.30%	2.30%
wells	20	56	7.14%	0
MTBE***				
wells & springs	134	351	4.80%	0

fertilizers and have been used for many years on croplands and lawns. Nitrates contained in fertilizers can pollute surface and groundwater. Consumption of high levels of nitrate contaminated water poses a particular health risk to infants under 6 months of age affecting the blood's ability to carry oxygen. The drinking water standard for nitrate is 10 milligrams per liter. Nitrate was detected above the drinking water standard in less than 1 percent of the springs and 4.3 percent of the wells sampled. The highest nitrate levels in Kentucky have been detected in shallow, hand-dug wells, while the lowest nitrate levels occur in deeper, drilled wells. Improper water well construction and inadequate maintenance can also make these wells more susceptible to nitrate contamination.

Water wells in the eastern and western coalfields often contain high iron, manganese and sulfur levels. Water well users commonly experience strong sulfur smells in their water, iron staining of appliances and laundry, and bacterial growth in the well. The occurrence of iron, manganese and sulfur in wells is also associated with poor water well construction and improper well maintenance.

Several measures have been undertaken to protect groundwater resources in Kentucky. These include regulations requiring facilities that have the potential to pollute groundwater to develop and implement groundwater protection plans by 2003. The Division of Water has reviewed 20 generic and 228 site specific groundwater protection plans. To date, 162 plans have been approved.

Measures - notes and sources

***Measure 1**. Based on best professional judgement by the Ky. Division of Water. Sources not ranked. Source: Ky. Division of Water.*

***Measure 2**. Based on tests conducted between 1995-1999. *Detections above health advisory limit or drinking water maximum contaminant levels. **Based on an assessment of 239 public water supply wells, springs and private wells. Arsenic detects above standard is based on proposed MCL of 0.01 mg/L. ***Data not broken down by wells and springs. Source: Ky. Division of Water.*

Indicator 4. Fish Kills and Fish Consumption Advisories

Background Kentucky's waterways provide habitat to numerous species of plants, animals and fish. But pollution and ecosystem alterations, such as dams and the removal of vegetation along waterways, have impacted several species of aquatic life. For example, 40 percent of the state's 103 native mussels now are considered rare, and 61 species of freshwater fish are considered at risk due to pollution and ecosystem alterations. In 1997-1999, 22 percent of the 8,581 miles of waterways assessed for aquatic life could not fully support or only partially support this use.

Goal Ensure that the waters of the Commonwealth support healthy fish populations and that the fish are safe to eat.

Progress Data reveal a general decline in the number of fish kill incidents in the Commonwealth. The decline may be attributed to better controls to prevent and contain spills and avoid contamination of waterways.

However, in May 2000, a fire at the Wild Turkey Distillery set the record for the number of fish killed from a single spill in Kentucky. The fire at the distillery in Anderson County resulted in the release of 500,000 gallons of bourbon into the Kentucky River. The incident caused a record 227,692 fish to perish. The state estimated the value of the fish at $471,621. The parent company of Wild Turkey Distillery agreed to compensate the state $256,000 to cover the cost of the fish killed due to the incident.

Toxic chemicals are also increasingly being detected in fish tissue as more testing occurs. State health and environmental officials added two new fish consumption advisories in 2000 to the existing six. In April 2000, a fish consumption notice was issued for all waterways and lakes due to low levels of organic mercury found in fish tissue. Women of childbearing age and children six years and under have been advised not to eat more than one meal per week of freshwater fish. A major source of mercury is emissions from coal-fired power plants. The U.S. Environmental Protection Agency has indicated that it plans to draft regulations to limit

At a Glance

Miles of waterways assessed for aquatic life 8,581

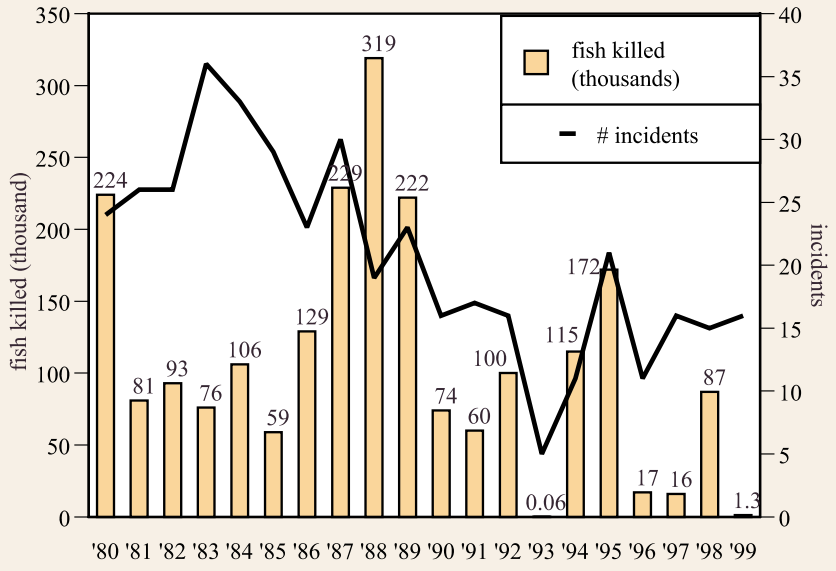
Percent of assessed waterways not or partially supporting aquatic life 22%

Number of fish killed due to pollution incidents in the past ten years 642,360

Number of fish consumption advisories in effect. 8

Pollutants of concern in fish consumption advisories
mercury . . . 3 advisories
pcbs . . . . . 6 advisories

Measure 1. Fish Kill Incidents and Fish Killed in Kentucky



Fish Kills and Advisories

Measure 2. Fish Consumption Advisories in Effect in Kentucky

Stream (counties)	pollutant	year listed	miles	source	fish
Town Br./Mud Rvr. (Logan,Butler,Muhlenberg)	PCBs	1985	71.5	dye-cast plant	all species
West Fork Drakes Creek (Simpson, Warren)	PCBs	1985	46.9	adhesive plant	all species
Little Bayou Creek (McCracken)	PCBs	1985	6.5	gaseous diffusion plant	all species
Ohio River (entire length Ky. border)	PCBs	1989	663.9	industry urban runoff	*
W. Ky. Wildlife Area (McCracken)	mercury	1993	5 ponds	unknown	bass
Green River Lake (Taylor, Adair)	PCBs	1994	entire lake	gas compression station	catfish carp
All waterways	mercury	2000	all	unknown	all species
Metropolis Lake	mercury PCBs	2000	entire lake	unknown	all species

mercury releases from power plants. New requirements are not expected to go into effect until 2004.

In July 2000, a fish advisory was issued for Metropolis Lake in McCracken County because of elevated polychlorinated biphenyls (PCBs) and mercury. The advisory recommends that no more than one meal per month of most fish found in the lake should be eaten. Six fish consumption advisories issued previously remain in effect in Kentucky.

PCBs (probable human carcinogens, according the U.S. Environmental Protection Agency and Centers for Disease Control) and mercury are the contaminants of concern in the fish consumption advisories issued in Kentucky. The Ohio River advisory was modified in 2000 in response to declining levels of PCBs found in paddlefish. Limited consumption of paddlefish is now allowed. In addition, the pesticide chlordane has been removed as a contaminant of concern in the Ohio River fish consumption advisory. Levels of this contaminant have decreased.

Measures - notes and sources

***Measure 1**. Incidents as reported and investigated by the Ky. Department of Fish and Wildlife Resources. Source: Ky. Division of Water, Ky. Department of Fish and Wildlife Resources.*

***Measure 2**. The Ohio River and Mud River advisories are based on Great Lakes Advisory Protocols. Other advisories based on U.S. Federal Drug Administration action level guidelines. *Consumption guidelines providing for limited consumption of paddlefish, carp, channel catfish, smallmouth buffalo, white bass, white crappie, hybrid striped bass, drum, sauger, black bass, channel catfish and blue catfish have been specified by the Ky. Department for Public Health. Source: Ky. Division of Water, Ky. Department for Public Health.*

Indicator 5. Wastewater Treatment

Background In 1999, about 55 percent (2.2 million) of Kentucky's residents, were connected to municipal wastewater treatment systems.[1] Poorly operated and maintained wastewater treatment plants are the fifth leading source of pollution to monitored waterways in Kentucky. The environmental and health implications from the poor operation of these plants can be severe, impairing water quality with disease-causing bacteria, metals and nutrient-laden effluent. In addition to degrading surface water, sewage can migrate into groundwater through the limestone karst underlying almost half of Kentucky.

The number of wastewater plants continues to increase in Kentucky. In 1999, 3,608 wastewater treatment facilities were permitted to operate in the state, an increase of 16 percent since 1997. The greatest increase was in package plants, which now total 1,829. Package treatment plants are prefabricated plants of small capacity. An estimated 60 percent of the Kentucky households are connected to public sewers.

Goal Protect the waters of the Commonwealth by ensuring compliance with state and federal water rules, regulations, permits and enforcement actions.

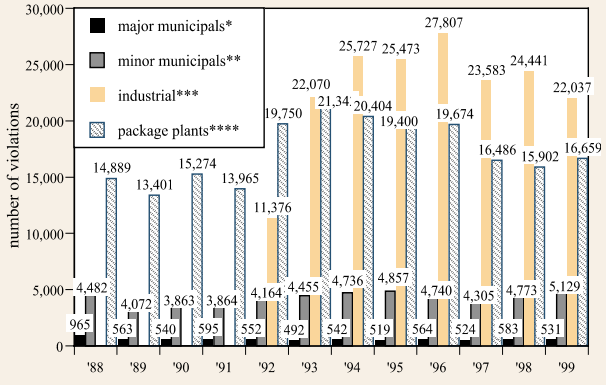
Progress During 1999, 53 percent (1,896 plants) of the 3,608 wastewater plants permitted to operate in Kentucky had one or more violations of water quality regulations. This was improvement since 1997 when 2,048 had violations. A majority of the 44,356 violations cited in 1999 were either monitoring or reporting infractions while 26 percent (11,689 violations), were violations of permit limits set to protect public health and the environment.

Package treatment plants account for 38 percent of the wastewater permit limit violations. Poor maintenance and operation have led the state to target problem plants for removal or regionalization. Between 1995 and 1999, 275 package plants have been deactivated.

Efforts to upgrade and build new municipal wastewater treatment plants continue. Millions of dollars in federal, state, local and private funds have been invested in wastewater treatment. For example, between 1989 and 1999, 119 projects totaling $284 million have been funded through a low-interest state wastewater revolving loan program. But an estimated $3.2 billion is still needed over the next 20 years to meet statewide wastewater construction needs.

A state program to require industries to pretreat their wastewater prior to its discharge to a municipal wastewater treatment plant has assisted in reducing pollutants released to water-

Measure 1. Violation Trends at Wastewater Treatment Plants in Kentucky



At a Glance

Number of households served by waste treatment plants
. . . . . 55%

Number of wastewater treatment plants
1995 3,227
1997 3,089
1999. 3,608

Number of violations cited at plants
1995 50,249
1997. 44,898
1999 44,356

Percent of wastewater treatment plants with violations
1995 . . . . . 60%
1997 . . . . . 66%
1999. . . . . .53%

Plants with violations (by type of plant, 1999)
package plants. . . . 833
minor industrial. . . 807
minor municipal . . . 157
major municipal 51
major industrial 48

Cost to meet wastewater infrastructure construction needs in next 20 years
. . . . . $3.2 billion

Measure 2. Types of Wastewater Treatment Plants and Violations of Regulatory Requirements in Kentucky (1999)

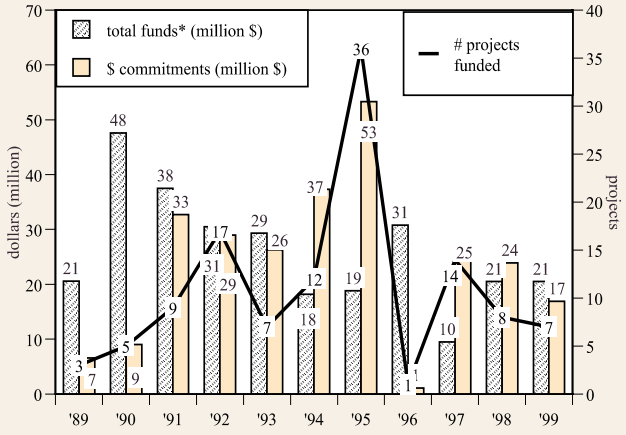
type of plant	number of plants	# of plants in violation	% plants in violation	total violations*	violations of permit limits
Major Municipal	70	51	73%	531	324
Minor Municipal	178	157	88%	5,129	2,164
Major Industrial	58	48	83%	326	234
Minor Industrial	1,473	807	55%	21,711	3,487
Package	1,829	833	46%	16,659	5,480
Total	**3,608**	**1,896**	**53%**	**44,356**	**11,689**

Wastewater Treatment

Measure 3. Wastewater Pretreatment Programs - Number of Industrial Users in Noncompliance in Kentucky

wastewater treatment plant	# industrial users	# in non-compliance
Ashland	5	1
Auburn	1	1
Bardstown	17	3
Beaver Dam	7	1
Bowling Green	24	5
Campbell/Kenton Co.	47	1
Campbellsville	6	1
Carrollton	2	1
Elizabethtown	21	2
Frankfort	15	2
Franklin	10	2
Fulton	3	3
Glasgow	15	2
Harrodsburg	6	3
Lawrenceburg	6	1
Lebanon	8	2
Leitchfield	11	3
Lexington	38	6
London	10	9
Louisville	121	28
Mayfield	6	3
Maysville	6	1
Monticello	3	1
Morehead	6	1
Morganfield	4	2
Mount Sterling	7	3
Owingsville	1	1
Paris	8	1
Princeton	1	1
Richmond	25	2
Russellville	6	1
Shelbyville	14	1
Somerset	29	3
Springfield	5	3
Stanford	2	1
Williamstown	4	1
Winchester	15	4
Total (1999*) 37	**679**	**106**
Total (1997*) 39	**543**	**96**
Total (1996*) 21	**340**	**56**
Total (1994*) 19	**339**	**52**
Total (1992*) 27	**41**	**115**

Measure 4. Kentucky Wastewater Infrastructure Loan Fund



ways. Pretreatment programs are in effect at 679 industrial facilities in 65 cities. During 1999, 106 of the 679 industrial facilities (15.6 percent) were in significant noncompliance with their pretreatment requirements at sometime during the year.

Combined sewer overflows (CSOs) are a problem in older cities where stormwater runoff is carried in sanitary sewer pipes. During storms, the sewers overflow and discharge raw sewage into receiving waters. The Division of Water has identified 17 cities with CSOs and 293 CSO outfall points. Louisville has the greatest number of CSOs at 115. The elimination of CSOs can be costly and in many cases not practical. Only 15 CSOs have been eliminated since 1996. Instead, efforts are being made to control CSOs to prevent discharges.

Footnotes

1. Water Resource Development: A Strategic Plan for Wastewater Treatment, Draft, Kentucky Water Resource Development Commission, April, 2000.

Measures - notes and sources

***Measure 1**. *Major municipals treat 1,000,000 gallons or more per day. **Minor municipals treat less than 1,000,000 gallons per day. ***Industrial facilities treat effluent generated during manufacturing process (data not available prior to 1992). ****Package treatment plants are prefabricated plants of small capacity. Source: Ky. Division of Water.*

***Measure 2**. *Includes permit, monitoring and reporting violations. Source: Ky. Division of Water.*

***Measure 3**. *July-December reporting period. Significant noncompliance as defined by 40 CFR 403.8(f)(2)(vii). Source: Ky. Division of Water.*

***Measure 4**. *Includes federal grants, state match and interest incurred. In 1996, most of the money distributed went to existing projects. Source: Ky. Division of Water.*

Indicator 6. Onsite Sewage Treatment and Disposal

Background An estimated 45 percent of the state's population depend on private package plants, septic systems, artificial wetlands, other systems or have no treatment system for waste disposal.[1] According to the 1990 U.S. Census, about 600,000 housing units, depend upon onsite systems to treat sewage. About 37 percent of new home constructions in the state are now using onsite sewage systems for wastewater treatment, according to the Kentucky Onsite Wastewater Association.

Failing septic systems and illegal straight pipe discharges of sewage from homes and businesses are contributing to pollution problems in a number of Kentucky waterways. While it is not known how many failing septic systems and illegal straight pipes are discharging raw sewage into waterways, it is considered a widespread problem across the state. Onsite sewage disposal is the fourth leading source of water pollution in Kentucky's monitored waterways, according to the Kentucky Division of Water. Close to 4,000 complaints were received by local health officials in 1999 regarding onsite sewage systems. Kentucky leads the nation in the number of rural households without complete plumbing, according to the Rural Community Assistance Program.[2]

Goal Protect the waters of the Commonwealth through the proper construction, installation and alteration of onsite sewage disposal systems (KRS 211.350).

Progress Each year, thousands of onsite septic system permits are issued by local health departments. During fiscal year 1999-00, more than 22,000 onsite sewage permits were issued, double the number just five years ago. The increase in the number of permits is attributed, in part, to Senate Bill 18 passed by the 1998 General Assembly. The law prohibits the connection of electricity to a new residence unless the owner has an approved plan to install adequate sewage-disposal facilities.

In 1998, a $4 million grant from the U.S. Department of Commerce was awarded to a 40-county area along the Kentucky River to address existing septic tank problems. The grant established a revolving loan fund to provide low-interest loans to homeowners who have straight pipe sewer lines or failing septic tanks. To date, $6 million in loans has been distributed to 2,369 households for septic systems or sewage line hookups as part of the program.

In May 1999, the Environmental Quality Commission (EQC) embarked on a project to assess onsite sewage issues and policy needs in Kentucky. EQC conducted more than 30 interviews and surveyed county health departments to identify onsite sewage issues and policy needs. On Sept. 23, 1999, EQC convened a roundtable discussion of 37 individuals to review various onsite policy options. EQC issued seven key and nine additional recommendations based on its findings.

In response to the recommendations, the Kentucky Division of Water and the Kentucky Department for Public Health are developing an Onsite/Decentralized Wastewater Action Plan. The plan will focus on education, watershed-based remediation planning, funding, onsite/decentralized sewage management and regulatory changes.

At a Glance

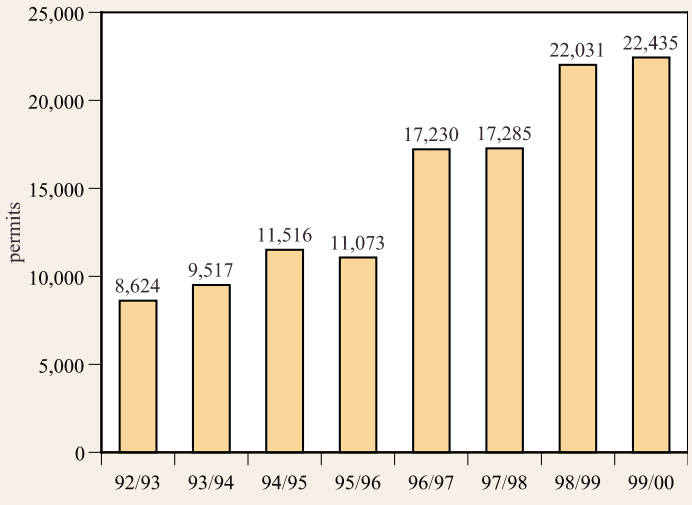
Number of households depending upon onsite sewage systems . . 45%

Number of onsite sewage permits
1995 11,073
1998 22,031
1999 22,435

Extent of water pollution caused by onsite sewage
. . . . 4th leading source

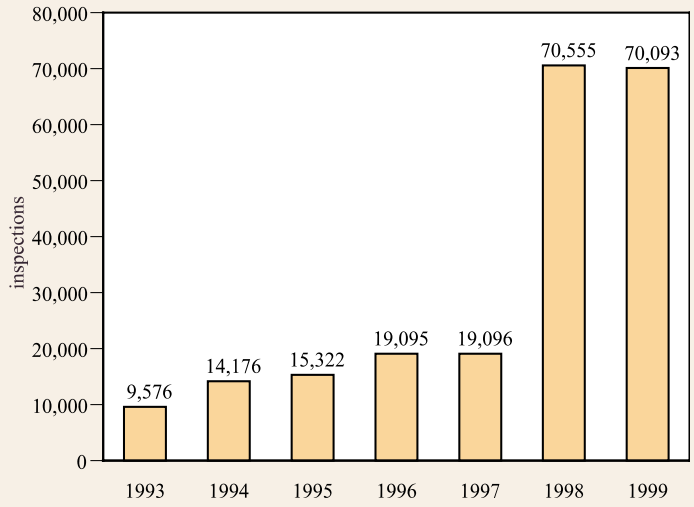
Onsite sewage complaints
1995. 3,326
1998. 5,008
1999. 3,960

Measure 1. Onsite Sewage Disposal Permits Issued in Kentucky

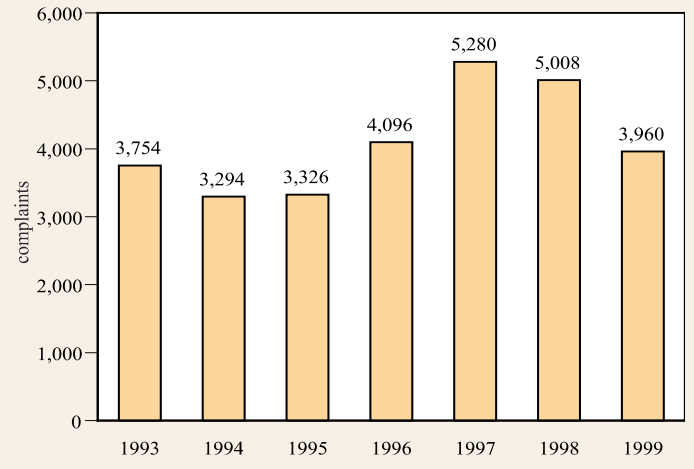


Onsite Sewage

Measure 2. Onsite Sewage Inspection Trends in Kentucky



Measure 3. Onsite Sewage Complaint Trends in Kentucky



Some rural electric cooperatives have expressed an interest in helping communities manage onsite sewage systems. Several demonstration projects are underway, including one in the community of Preston in Bath County. The Rural Electric Cooperative will manage, operate and maintain the effluent collection system, lagoon treatment and subsurface disposal systems of 110 homes.

State legislation was also passed in 1998 to address discharges of untreated sewage from houseboats. The law required all houseboats with marine toilets to have sanitation devices to treat or store wastewater and all marinas to have sewage pumpout stations by July 15, 2000. The state water patrol has initiated measures to educate houseboat owners and marinas about the law. Water patrol officials report they plan to begin enforcing the houseboat law in the spring of 2001.

Footnotes

***1**. Water Resource Development: A Strategic Plan for Wastewater Treatment, Draft, Water Resource Development Commission, April 2000.*
***2**. Still Living Without the Basics, Rural Community Assistance Program, 1996.*

Measures - notes and sources

***Measure 1**. Based on state fiscal year. Data on septic tank permits prior to 1992-93 not available. Source: Ky. Department for Public Health.*
***Measure 2**. Source: Ky. Department for Public Health.*
***Measure 3**. The increase in inspections during 1998 and 1999 is attributed to Senate Bill 18, improvements in the data collection system, and more accurate and standardized reporting by local health inspectors. Source: Ky. Department for Public Health.*

WATER RESOURCES

Indicator 7. Enforcement and Compliance

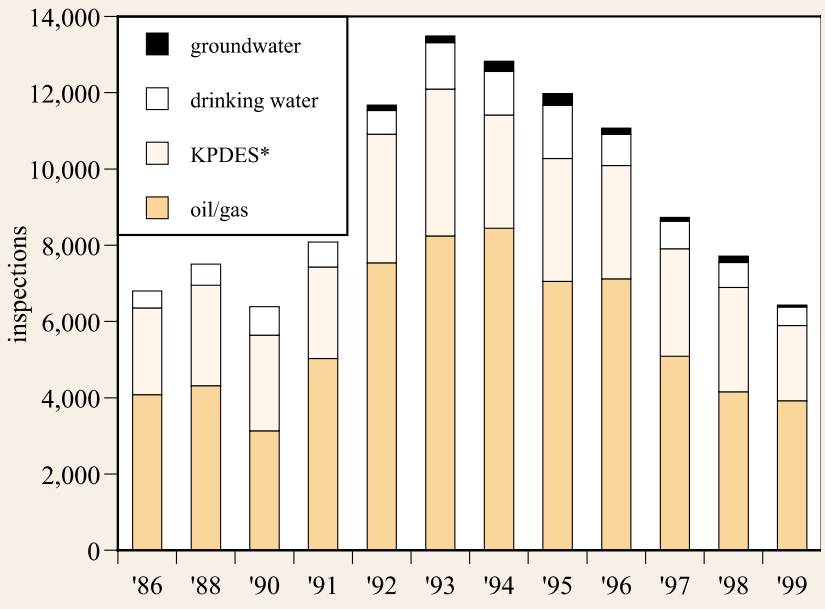
Background State efforts to restore water quality have historically emphasized the control of industrial and municipal discharges into waterways. Under the federal Clean Water Act of 1972 and state law, the discharge of pollutants into the waters of the Commonwealth is prohibited unless a Kentucky Pollutant Discharge Elimination System (KPDES) permit is issued. These permits limit the amount of pollutants discharged, require monitoring of discharges, and must be renewed every five years. During the past decade, the Kentucky Division of Water has focused additional attention on addressing other sources of water pollution including polluted runoff from agriculture, timber and construction operations and urban areas.

Goal Protect the waters of the Commonwealth by ensuring compliance with water rules, regulations, permits and enforcement actions.

Progress Many water quality improvements witnessed during the past several years have been the result of the enforcement of Clean Water Act rules. Businesses, industries, wastewater treatment plants, oil and gas operations, agricultural operations and other activities are inspected for compliance with state water quality permits and regulations. Trends reveal that Kentucky Division of Water inspections hit an all-time high in 1993, totaling 13,490. Inspections have since declined and in 1999 reached their lowest levels (6,174) since EQC began tracking this indicator.

The decline of inspections during 1999 is attributed to a combination of factors, including efforts to assist communities during 1999 drought, targeted enforcement of open dumpers, and surveys of animal feeding operations. The division reports that close to 1,300 surveys were conducted to identify poultry, hog and other confined animal feeding operations. The surveys were in response to new state requirements to address environmental problems associated with such operations. The division also reports that the drop in inspections may be attributed to staff turnover.

Measure 1. Water Quality Inspection Trends in Kentucky



ENFORCEMENT AND COMPLIANCE

At a Glance

Number of water permits (coal, industrial and municipal facilities). 7,197

Water permits for oil and gas operations 10,912

Inspections
1995. 11,978
1997 8,740
1999 6,174

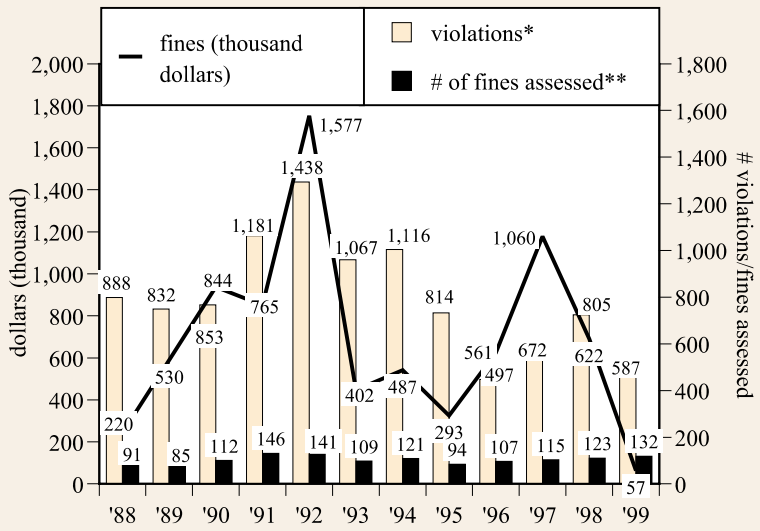
Violations
1995 814
1997 672
1999 587

Percent of major facilities in significant noncompliance with effluent discharge limits
1997. . . . . .11%
2000 . . . . . 14%

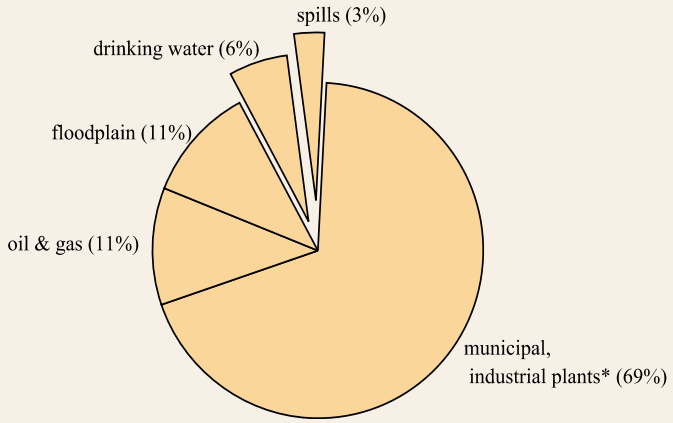
Complaints
1995 2,358
1997 3,073
1999 2,934

Enforcement and Compliance

Measure 2. Water Quality Violation and Penalty Trends in Kentucky



Measure 3. Water Quality Violations by Type in Kentucky



Water inspectors also respond to citizen complaints. Nearly 25 percent of the 2,934 complaints in 1999 concerned sewage.

Industrial and municipal facilities were the most frequent violators of clean water rules during 1999, accounting for 69 percent of the 587 violations cited by field inspectors. In addition, the Kentucky Division of Water's Permit Branch reports that in 1999, 16 of the 125 major facility water permits were in significant noncompliance (SNC) for failure to report required monitoring results or for effluent discharges above permitted limits.

Most violations are resolved through agreed orders or other means. However, some of the more serious infractions result in fines. During 1999, $57,000 in penalties were assessed against 122 entities, 87 of which were permitted facilities.

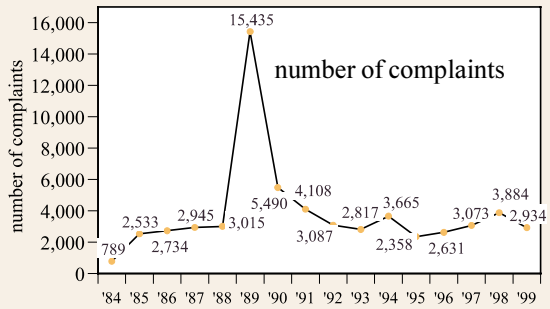
Measures - notes and sources

Measure 1. **Facilities with Ky. Pollution Discharge Elimination System (KPDES) Permits. Does not include inspections at KPDES permitted coal mines which are conducted by the Ky. Department of Surface Mining Reclamation and Enforcement. Does not include complaint and open dump investigations. Source: Ky. Division of Water.*

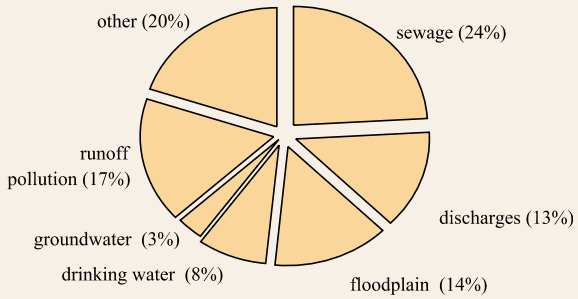
Measure 2. *Does not include coal mining water violations and penalties. *Violations cited by field inspectors. **Penalties assessed by the Ky. Division of Water, Enforcement Branch (does not include drinking water or federal government penalty assessments). Source: Ky. Division of Water.*

Measure 3. *Based on 587 violations cited by Division of Water field inspectors in 1999. Does not include coal mining water violations and penalties. *KPDES discharges (Data not available by individual sources such as municipal or industrial facilities). Source: Ky. Division of Water.*

Measure 4. Number and Types of Water Quality Complaints in Kentucky



Types of Complaints



Measure 4. *Data include only complaints received by the Ky. Division of Water. The increased number of complaints reported for 1989 is attributed to public concerns about the Jamestown/ Union Underwear discharge to Lake Cumberland/Lily Creek. Source: Ky. Division of Water.*

Measure 5. *STP - sewage treatment plant. Significant noncompliance is defined as those facilities with two to four exceedances of permit limits in a six-month period. Major facilities currently include 69 major municipal wastewater treatment plants, 51 industrial and 4 federal facilities that treat one million gallons or more per day. Source: Ky. Division of Water.*

Measure 5. Major KPDES Facilities in Significant Noncompliance (1999)

Facility	County
Paris STP	Bourbon
AK Steel Corp. Coke Plant	Boyd
Cattlettsburg Refining LLC	Boyd
Murray STP	Calloway
Lancaster STP	Garrard
Arvin Roll Coater Inc.	Hancock
Commonwealth Aluminum	Hancock
NSA Div. of Southwire Co.	Hancock
Ky. Power Co. Big Sandy	Lawrence
London STP	Laurel
Westlake CA&O Corp.	Marshall
ISP Chemicals	Marshall
Maysville STP	Mason
Bardstown STP	Nelson
Western Ky. Energy Wilson	Ohio
Somerset STP	Pulaski

Chapter 3

Air Quality

AIR QUALITY

AMBIENT AIR

Indicator 1. Ambient Air Concentrations

Background There are numerous sources of air pollution, including point (i.e., smokestack), mobile (i.e., automobile and off-highway vehicle exhaust) and area sources (i.e., small paint shops, gas stations, open burning) in Kentucky. The federal Clean Air Act (CAA) of 1970, along with modifications in 1977 and amendments in 1990, has significantly improved the quality of air Kentuckians breathe. The CAA specifies controls for six criteria pollutants: ozone, nitrogen oxide, carbon monoxide, sulfur dioxide, particulates and lead. These pollutants can cause serious threats to human health and ecosystems and consequently have been the primary focus of federal and state air pollution programs.

The Kentucky Division for Air Quality operates a network of 98 air monitoring stations in 34 counties. The Jefferson County Air Pollution Control District operates an additional network of 29 monitors. These stations provide data used by the Environmental Quality Commission to track yearly average concentrations of air pollutants in Kentucky.

Goal Ensure ambient air is safe to breathe.

Progress Since 1980, Kentucky, as well as the nation, has witnessed significant improvements in air quality. Pollution controls on industrial sources and automobiles have resulted in a statewide trend of declining average air concentrations of criteria pollutants.

All areas of the state currently meet the national ambient air quality standard for all of the criteria pollutants, although Louisville has yet to be redesignated for meeting the 0.12 parts per million (ppm) 1-hour ozone standard. Trends reveal that air concentrations of most of these criteria pollutants continue their downward trend. For example, between 1995 and 1999, sulfur dioxide concentrations declined 10 percent, particulates fell by 7 percent, nitrogen dioxide levels dropped by 6 percent, and carbon monoxide ambient concentrations declined by 15 percent. Ozone air concentrations have fluctuated in the past several years. Between 1995 and 1999, statewide ambient air concentrations of ozone rose 2.7 percent.

At a Glance

Number of ambient air quality monitors in Ky. 127

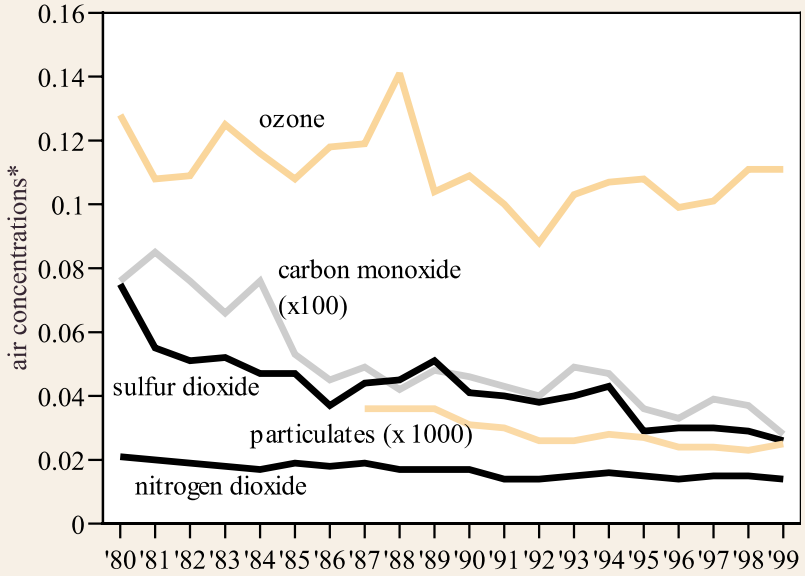
Number of counties with air quality monitors. 35

Percent decline/ increase in ambient air concentrations of pollutants (1995-1999)
ozone . . . . . +2.7%
carbon monoxide. . -15%
sulfur dioxide . . . -10%
particulates. . . . . -7%
nitrogen dioxide . . -6%

Measures - notes and sources

Measure 1*. *Concentrations from state-monitored sites based on the following: ozone: averaged second maximum, one-hour standard. Carbon monoxide: second maximum eight-hour average. Nitrogen dioxide and particulates (PM_{10}): annual statewide averages. SO_2: second maximum, 24-hour average. Concentrations in parts per million for all pollutants except particulates, which are measured in micrograms per cubic meter. Source: Ky. Division for Air Quality.*

Measure 1. Air Concentrations of Pollutants in Kentucky



Industrial Air Emissions

Indicator 2. Industrial Air Emissions

At a Glance

Number of regulated air pollution sources 2000. 3,667

Decline/increase in statewide industrial air emissions (1995-99)

SO_2. . . . . -3%
NOx. . . . . +1%
CO. . . . . +46%
VOCs . . . . . -23%
PM_{10} . . . . . -7%

Background There are thousands of sources of air pollution in Kentucky. The Kentucky Division for Air Quality and the Jefferson County Air Pollution Control District regulate point, mobile and area sources of air pollution in the state. The Division for Air Quality currently regulates 1,766 permitted, 411 registered and 159 other sources of air pollution. The division regulates 271 of these facilities as major sources, emitting 100 tons or more of air pollutants each year. The Jefferson County Air Pollution Control District regulates 789 industrial sources and 542 service stations. Of these, 21 are considered major sources.

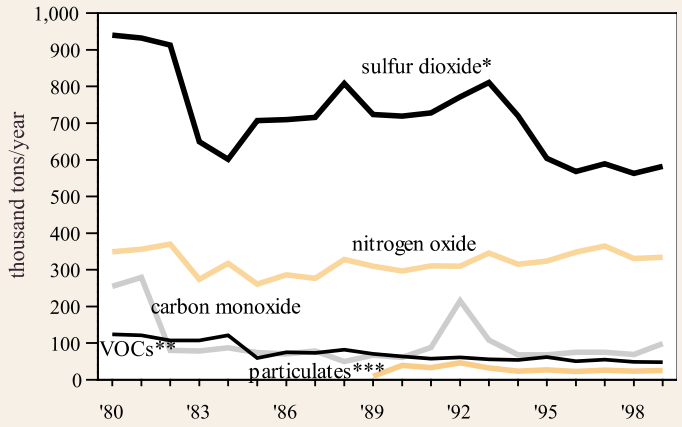
Goal Limit emissions of air pollutants to levels that meet air quality standards and protect human health and the environment.

Progress Trends reveal that environmental controls to reduce air pollution as required under the Clean Air Act have reduced emissions released by regulated sources, resulting in lower ambient air concentrations of many of the criteria air pollutants. The greatest reductions can be observed for sulfur dioxide emissions. These emissions dropped by 38 percent between 1980 and 1999. Sulfur dioxide emissions continue to decline in response to reductions required under the 1990 Clean Air Act Amendments. Between 1995 and 1999, sulfur dioxide emissions dropped by 3.5 percent.

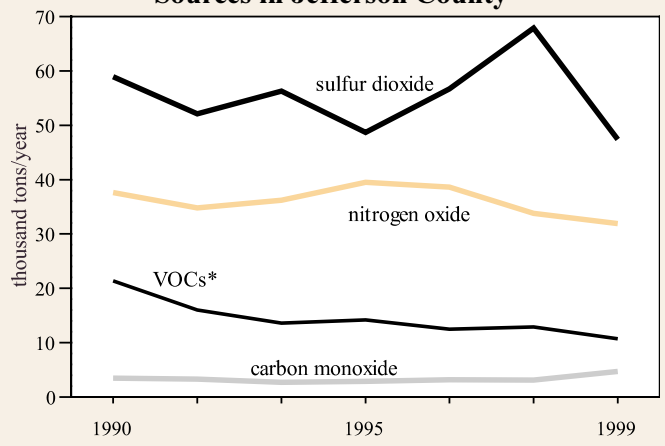
Trends reveal that nitrogen oxide and particulate emissions have remained steady during the past two decades. Nitrogen oxide emissions are expected to decline in the future due to requirements of Phase II of the national acid rain program, as well as recent U.S. Environmental Protection Agency rules to curb this pollutant.

Emissions of volatile organic compounds (VOCs), a contributor to ground-level ozone, declined by 61 percent between 1980 and 1999. In Jefferson County alone, industrial emissions of VOCs dropped by 50 percent between 1990 and 1999. The recent statewide increase in carbon monoxide emissions is attributed to updated information based on new stack testing conducted by National Southwire Aluminum in 1999, which more accurately reflects their carbon monoxide emissions.

Measure 1. Statewide Air Emissions From Regulated Sources in Kentucky (Excludes Jefferson County)



Measure 2. Air Emissions From Regulated Sources in Jefferson County



Measures - notes and sources

Measure 1. *Excludes Jefferson County because the Jefferson County Air Pollution Control District was unable to provide data for years prior to 1990. *Decline in sulfur dioxide emissions in 1983-84 may have been due to closure of Tennessee Valley Authority power plants for repairs and installation of scrubbers. **VOCs - volatile organic compounds. 1980-88 VOC data represent total hydrocarbons. ***PM_{10} collection began in 1989. Source: Ky. Division for Air Quality.*

Measure 2. **VOCs - volatile organic compounds. Data prior to 1990 not available. Source: Jefferson County Air Pollution Control District.*

Indicator 3. Ground-Level Ozone

Background Although ozone acts as a protective layer high above the earth, ground-level ozone, a main ingredient in smog, can be harmful to human health. Breathing ground-level ozone at concentrations above the health-based standards is known to cause chest pain and coughing, and may worsen bronchitis, heart disease, emphysema and asthma.

Ground-level ozone is formed when volatile organic compounds (VOCs) such as chemical solvents, gasoline vapors and oxides of nitrogen (NOx) react with sunlight. VOCs are emitted by a variety of sources, including motor vehicles, chemical plants, refineries, factories and natural sources. Nitrogen oxides are emitted from motor vehicles, power plants and other sources of combustion. High ozone levels are most prevalent during the summer months when the air is hot and stagnant. Winds can also transport ozone and other pollutants to downwind areas, exacerbating ground-level ozone.

Goal Implement and enforce requirements to meet the ozone standard (0.12 parts per million averaged over one hour) as required by federal and state law. Adopt new federal measures designed to reduce regional transport of ozone and achieve the new ozone standard (0.08 parts per million averaged over eight hours) by 2007.

At a Glance

Number of Kentucky counties in compliance with the 1-hour 0.12 ppm ozone standard. 120

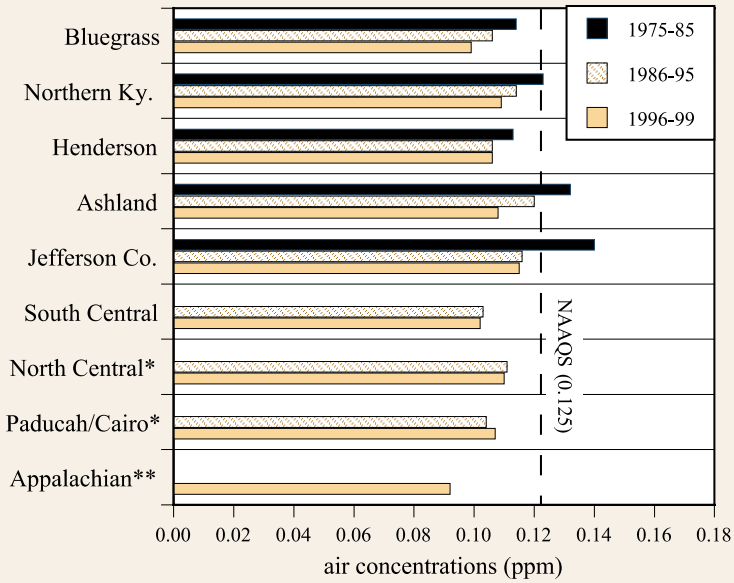
Number of Kentucky counties that will likely not meet the 8-hour 0.08 ppm ozone standard. 25

Progress Technologies to control VOCs, such as catalytic converters on automobiles, have led to a decrease in the number and severity of ozone standard exceedances in Kentucky. All but the Louisville area of Kentucky has been designated as attaining the 0.12 parts per million (ppm) standard. Although the Louisville area (Jefferson and portions of Bullitt and Oldham counties) has not been officially redesignated to attainment, air monitoring for the 1998-2000 period shows compliance with the 0.12 ppm standard. In April 2001, the state, along with the Jefferson County Air Pollution Control District filed a request to the U.S. Environmental Protection Agency (EPA) to redesignate the area to attainment for the 1-hour ozone standard.

Attainment with the 1-hour ozone standard in Jefferson County is attributed to several control measures that have been in effect in the Louisville area for several years. These include the vehicle emission testing (VET) program, the use of reformulated gasoline, and pollution controls on all major and many minor industrial and commercial sources. In 1999, the Jefferson County VET program inspected 444,315 vehicles. Of that total, 33,223 vehicles were retested after initially failing the test. A total of 10,381 vehicles did not ultimately pass subsequent retests. The county granted 1,492 waivers to failing vehicles that could not be repaired to pass the testing requirements. Changes adopted by the Kentucky General Assembly during the 2000 legislative session now exclude motorcycles, public and private buses, pre-1968 vehicles and commuter vehicles (those vehicles registered in Kentucky counties outside of Jefferson but used by owners to travel to Jefferson County workplaces), from the VET program. As a result, nearly 25,000 fewer vehicles (a 5.5 percent reduction) will now undergo annual emissions testing in Jefferson County.

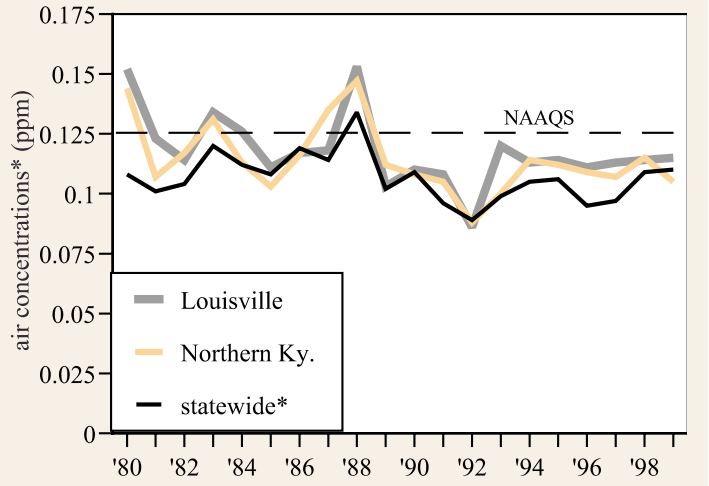
The Northern Kentucky region (Boone, Kenton, and Campbell counties) began a vehicle emissions testing program in September 1999

Measure 1. Average Regional Concentrations of Ozone (0.12 ppm 1-Hour Standard) in Kentucky

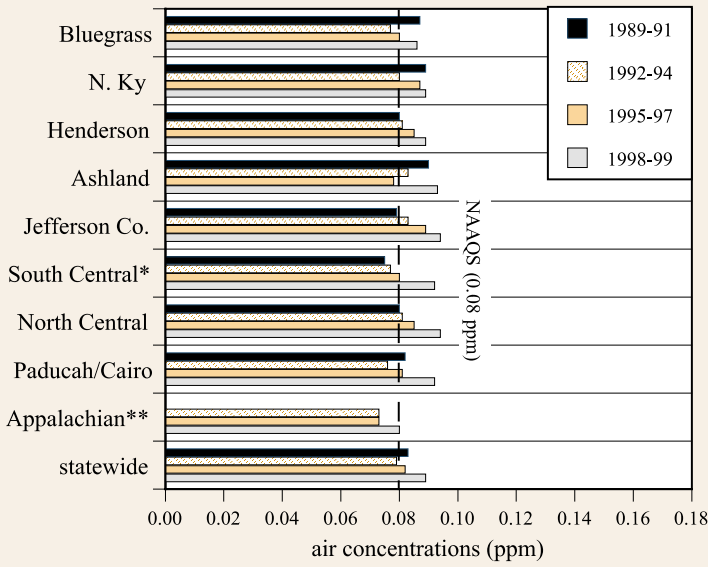


Ground-Level Ozone

Measure 2. Ground-level Ozone Concentrations (0.12 ppm 1-Hour Standard) in Kentucky



Measure 3. Regional Air Concentrations of Ground-level Ozone (0.8 ppm 8-Hour Standard)



to help reduce ozone concentrations in the area. Approximately 236,000 vehicles will be tested every two years. From September 1, 1999, through October 31, 2000, 91,814 vehicles have been tested by the Northern Kentucky program. Of those, 6,749 vehicles have failed the test and 1,848 have received waivers.

In 1997, the U.S. EPA reduced the concentration of ozone allowed in the air from 0.12 ppm to 0.08 ppm. The new standard is averaged over eight hours rather than the one hour used by the existing standard. Based on 1997-1999 monitoring data, 21 Kentucky counties will not meet the new ozone standard. Another four counties may be added to this list, based on 1998-2000 monitoring data.[1]

Soon after the 8-hour ozone air quality standard was finalized in 1997, a host of industry groups, trade organizations and three states, led by the American Trucking Association, filed a lawsuit to halt implementation of the regulations. Opponents argued that the U.S. EPA should have to consider the costs of achieving cleaner air when setting standards. In Feb. 2001, the Supreme Court overturned an earlier circuit court ruling, upholding the rights of the U.S. EPA to set health-based standards and rejecting arguments that the agency must balance the negative health effects of pollution against the economic effects of the regulation. However, the court also rejected the U.S. EPA's rules on implementing new rules for ground-level ozone and ordered the agency to develop a more "reasonable" interpretation of the law.

Footnotes

***1**. The 21 counties not meeting the 8-hour ozone standard based on 1997-99 monitoring data are: Boone, Boyd, Bullitt, Cambpell, Christian, Daviess, Edmonson, Fayette, Graves, Greenup, Hancock, Henderson, Jefferson, Kenton, Livingston, McCracken, McLean, Oldham, Scott, Simpson and Trigg. The four additional counties not meeting the 8-hour ozone standard based on 1998-2000 monitoring data are: Bell, Carter, Hardin and Pulaski.*

Measures - notes and sources

***Measure 1**. NAAQS - National Ambient Air Quality Standard. *Less than 10 years of data available for 1976-85. **Less than 10 years of data available for 1986-95. Based on second maximum one-hour ozone average. Source: Ky. Division for Air Quality.*

***Measure 2**. NAAQS - National Ambient Air Quality Standard. *Excludes monitors from Boone, Kenton, Campbell, Jefferson, Oldham and Bullitt counties. Based on second maximum one-hour ozone standard. Source: Ky. Division for Air Quality.*

***Measure 3**. NAAQS - National Ambient Air Quality Standard. Based on the regional 3-year average of eight-hour fourth maximum ozone standard with the exception of a 2-year average for 1998-99. *Data not available for 1989-90. **Data not available for 1989-91. Source: Ky. Division for Air Quality.*

Indicator 4. Nitrogen Dioxide

Background National ambient air quality standards limiting the amount of nitrogen dioxide in the air were established because high concentrations are known to impair human health. Nitrogen oxides also combine with water to form acids and contribute to the formation of acid rain and ground-level ozone. Nitrogen dioxide (NO_2), a brownish mixture produced by fossil fuel combustion from sources such as cars and power plants, belongs to a family of highly reactive gases called nitrogen oxides (NOx).

During 1998, a total of 679,377 tons of NOx emissions were emitted in Kentucky.[1] Nearly half (47 percent) of these emissions came from coal-fired power plants (320,228 tons). Vehicles were responsible for 23 percent of the NOx emissions (156,058 tons).

Goal Implement and enforce requirements to meet the national standard of 0.05 ppm for nitrogen dioxide and to further reduce NOx emissions to meet other federally mandated requirements under the Clean Air Act. Specifically, two other control programs to lower ambient NOx levels have been mandated by the U.S. Environmental Protection Agency (EPA). The acid deposition provisions of the 1990 Clean Air Act Amendments require specific reductions from large NOx sources, primarily power plants.

In 1998, the U.S. EPA adopted a program to further reduce NOx emissions in the eastern half of the United States. Those reductions, generally referred to as the NOx SIP Call, are scheduled to be in place by May 2004. Adopted primarily as an aid for attainment and maintenance of the 1-hour ozone standard, these controls are anticipated to also aid in improving visibility and fine particulate pollution.

Progress Air concentrations in all regions of the state remain below the national standard for NO_2. While several individual power plants in Kentucky have reduced NOx emissions, total statewide nitrogen oxide emissions released from power plants increased by 11 percent between 1980 and 1999.

Kentucky is one of 19 states and the District of Columbia that must reduce the amount of

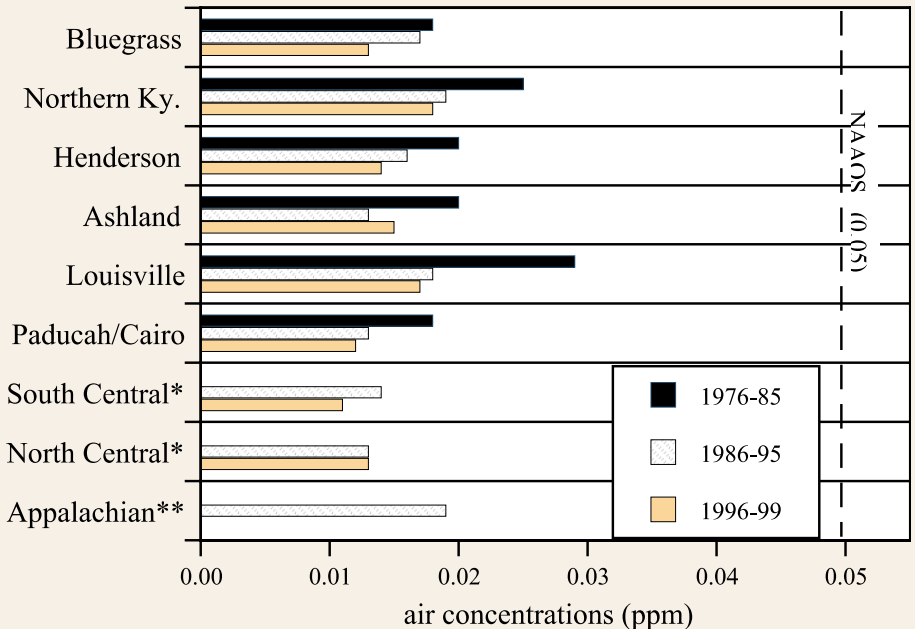
At a Glance

Number of Kentucky counties in compliance with NOx standard . 120

Principal sources of NOx emissions in Kentucky (1998)
power plants. 47%
highway vehicles . . 23%
off-highway 14%
industrial fuel combustion 12%

NOx power plant emissions in Kentucky
1980. . . . . .286,560 tons
1999. . . . . .319,457 tons

Measure 1. Regional Air Concentrations of Nitrogen Dioxide



Nitrogen Dioxide

Measure 2. Nitrogen Oxide Emissions from Power Plants in Kentucky

County	Facility	1980 tons	1990 tons	1999 tons	1980-99 % change
McCracken	TVA – Shawnee	32,065	25,349	37,912	+18
Muhlenberg	Ky. Utilities - Green	2,873	4,162	3,287	+14
Muhlenberg	TVA - Paradise	127,451	97,787	109,636	- 14
Ohio	W. Ky. Energy - Wilson	N/A	6,355	8,242	+30
Daviess	OMU	14,855	10,871	12,522	- 16
Hancock	W. Ky. Energy - Coleman	23,790	14,696	6,473	- 73
Henderson	Henderson Mun. Power	292	160	211	- 28
Webster	W. Ky. Energy - Reid*	10,736	9,839	6,824	- 36
Webster	W. Ky. Energy - Green	5,940	8,292	7,059	+19
Boone	Cinergy - East Bend	N/A	11,442	10,114	- 12
Carroll	Ky. Utilities - Ghent	20,226	22,980	27,962	+38
Bell	Ky. Utilities - Pineville	216	204	511	+136
Clark	E. Ky. Power - Dale	1,692	2,481	3,378	+99
Clark	E. Ky. Power - Smith	N/A	N/A	258	--
Fayette	Ky. Utilities - Haefling	28	26	19	- 32
Mercer	Ky. Utilities - Brown	12,046	11,319	8,435	- 30
Woodford	Ky. Utilities - Tyrone	449	518	815	+81
Lawrence	Am. Elec. Power - Big Sandy	N/A	25,249	20,376	- 19
Mason	E. Ky. Power - Spurlock	N/A	12,090	18,043	+49
Pulaski	E. Ky. Power - Cooper	3,177	6,594	4,087	- 38
Jefferson	LG&E - Mill Creek	16,391	19,475	18,499	+13
Jefferson	LG&E - Cane Run	14,333	8,674	7,202	- 50
Trimble	LG&E - Trimble	N/A	2,166	7,592	+250
Total	**23**	**286,560**	**300,729**	**319,457**	**+11**

NOx emitted from coal-burning power plants and other major combustion sources under a new U.S. EPA rule. The new rule is intended to reduce NOx emissions by 1.1 million tons per year in the eastern United States by the year 2004. The rule calls for reducing NOx emissions from electric generating units in Kentucky by approximately 66 percent. The plan also specifies a 60 percent reduction from large industrial boilers and a 30 percent reduction from large cement kilns. Kentucky will be responsible for emission cutbacks of 75,000 tons per ozone season (May through September). The Division for Air Quality has drafted regulations to implement the NOx reduction requirements.

Footnotes

***1**. NET Tier Report, Airsdata (1998), U.S. Environmental Protection Agency, 2000.*
***2**. Ibid.*

Measures - notes and sources

***Measure 1**. NAAQS - National Ambient Air Quality Standard. *Less than ten years of data available. ** Only one year of data available. Based on annual average at state monitored sites. Source: Ky. Division for Air Quality.*
***Measure 2**. *Includes Henderson units 1 & 2. N/A-no monitoring. Source: Ky. Division for Air Quality, Jefferson County Air Pollution Control District.*

Indicator 5. Sulfur Dioxide

Background Sulfur dioxide is a pungent, colorless gas that can cause respiratory illness and aggravate existing cardiovascular disease. Certain human populations are particularly sensitive to sulfur dioxide, including children, the elderly, asthmatics and individuals with chronic lung disease. Sulfur dioxide can also damage the foliage of trees and agricultural crops and is a major precursor to acid rain.

Sulfur dioxide (SO_2) is formed when fuel containing sulfur is burned. In Kentucky, 753,024 tons of sulfur dioxide emissions were emitted during 1998.[1] Coal-fired power plants were the leading source of SO_2 emissions. The Tennessee Valley Authority's Paradise Power Plant in Muhlenberg County led with 26 percent (153,928 tons) of the SO_2 power plant emissions, followed by American Electric Power's Big Sandy Plant in Lawrence County with 67,164 tons and Kentucky Utilities' Ghent Plant in Carroll County with 58,213 tons.

Goal Implement and enforce requirements to meet the national ambient air quality standard of 0.14 ppm for sulfur dioxide and the requirements of the 1990 Clean Air Act Amendments, which specify a 40 percent reduction in SO_2 emissions by the year 2000 (using 1980 as the baseline) as part of the Acid Deposition Control Program.

Progress The National Ambient Air Quality Standard for sulfur dioxide is being met throughout Kentucky, although the southern portion of Boyd County has not yet been redesignated as being in attainment.

Ongoing efforts by power plants to curb SO_2 emissions, as part of the 1990 national Acid Deposition Control Program, have likely contributed to the declining SO_2 air concentrations in some regions of the state. Total sulfur dioxide emissions from power plants in Kentucky fell 42 percent between 1980 and 1999 while the amount of coal burned at these plants increased 10.8 percent (from 31.1 million tons in 1980 to 34.46 million tons in 1999). Of the state's 23 power plants, 12 reduced sulfur dioxide emissions between 1980 and 1999. Additional SO_2 reductions are slated as part of Phase II of the national Acid Deposition Control Program. All power plants in Kentucky are in compliance with the acid rain requirements.

Kentucky's rainfall has become less acidic over the years, possibly due to the reduction of sulfur dioxide emissions. Data from monitoring stations in three eastern Kentucky counties reveal that the average pH of rainfall has become slightly less acidic in the past 12 years. The drop in pH in 1997 and 1998 is attributed to meteorological events, such as low rainfall levels that year, according to officials at the National Atmospheric Deposition Program.

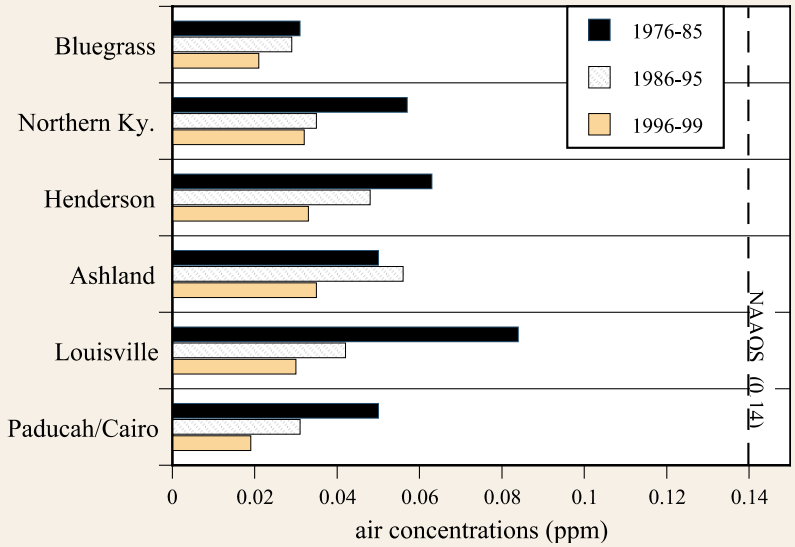
At a Glance

Number of Kentucky counties in compliance with SO_2 standard . 120

Principal sources of SO_2 emissions in Kentucky (1998)
power plants. 83%
industrial fuel combustion 7.5%
off-highway 3.5%

Power plant SO_2 emissions
1980. . . . 1,036,850 tons
1999. . . . . .595,585 tons

Measure 1. Regional Air Concentrations of Sulfur Dioxide in Kentucky



Footnotes

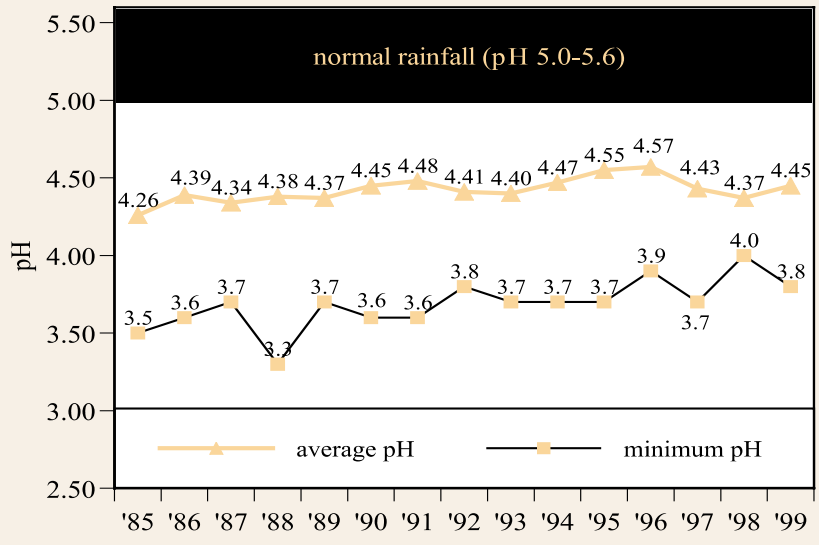
1. NET Tier Report, Airsdata (1998), U.S. Environmental Protection Agency, 2000.

Sulfur Dioxide

Measure 2. Sulfur Dioxide Emissions from Power Plants in Kentucky

County	Facility	1976 tons	1980 tons	1999 tons	1980-99 % change
McCracken	TVA – Shawnee	288,000	86,961	32,624	-62
Muhlenberg	Ky. Utilities - Green River	27,000	13,529	18,460	+36
Muhlenberg	TVA-Paradise	456,000	372,654	153,928	-58
Ohio	W. Ky. Energy - Wilson	N/A	N/A	10,415	—
Daviess	OMU	74,000	45,159	8,403	-81
Hancock	W. Ky. Energy – Coleman	100,000	78,650	36,406	-54
Henderson	Henderson Mun. Power	9,000	1,526	1,479	-3
Webster	W. Ky. Energy – Reid*	81,000	53,443	13,200	-75
Webster	W. Ky. Energy – Green	N/A	7,618	4,844	-36
Boone	Cinergy - East Bend	N/A	N/A	18,096	—
Carroll	Ky. Utilities – Ghent	76,000	84,553	58,213	-31
Bell	Ky. Utilities – Pineville	1,000	467	1,082	+131
Clark	E. Ky. Power - Dale	8,000	3,929	8,483	+115
Clark	E. Ky. Power - Smith	N/A	N/A	263	—
Fayette	Ky. Utilities - Haefling	5	5	.02	-100
Mercer	Ky. Utilities – Brown	57,000	53,153	45,956	-13
Woodford	Ky. Utilities - Tyrone	2,000	1,081	1,772	+63
Lawrence	Am. Elec. Power Big Sandy	60,000	61,617	67,164	+9
Mason	E. Ky. Power - Spurlock	NA	19,322	35,979	+86
Pulaski	E. Ky. Power - Cooper	35,000	12,743	19,331	+51
Jefferson	LG&E - Mill Creek	112,039	107,491	26,864	-75
Jefferson	LG&E - Cane Run	109,578	32,904	17,878	-46
Trimble	LG&E – Trimble	NA	NA	14,745	—
Total	**23**	**1,495,622**	**1,036,805**	**595,585**	**-42**

Measure 3. Average pH of Rainfall at Monitored Sites in Kentucky



Measures - notes and sources

***Measure 1**. NAAQS - National Ambient Air Quality Standard. Based on second maximum 24-hour average. Source: Ky. Division for Air Quality.*

***Measure 2**. *Includes Henderson Units 1 & 2. NA - Not operating. Source: Ky. Division for Air Quality, Jefferson County Air Pollution Control District.*

***Measure 3**. Volume-weighed averages from monitored sites in Washington, Letcher, Trigg and Rowan counties. Values have changed slightly from previous reports based on data retrieval. Source: National Atmospheric Deposition Program, Illinois State Water Survey.*

Indicator 6. Carbon Monoxide

Background Carbon monoxide (CO) is a colorless, odorless gas formed when the carbon in fuel is not burned completely. Carbon monoxide may cause serious health problems, including dizziness and slowed reflexes, when the standard is exceeded. At very high levels, CO is poisonous and can lead to death.

During 1998, sources emitted 1.37 million tons of CO.[1] Highway vehicles accounted for 68 percent of CO emissions in Kentucky during 1998, followed by off-highway at 16 percent, fuel combustion (7 percent), waste disposal and recycling (3 percent), metals processing (2 percent) and other (4 percent).

Goal Implement and enforce requirements to meet the national standard of 9.0 ppm for carbon monoxide using various emission control programs and technologies.

Progress All regions of the state currently meet the CO standard. Air concentrations of CO continue to decline in all regions of the state. The decline of CO air levels are attributed to pollution controls on automobiles, including national standards for tail pipe emissions, new vehicle technologies, and clean fuels programs such as the use of reformulated gasoline.

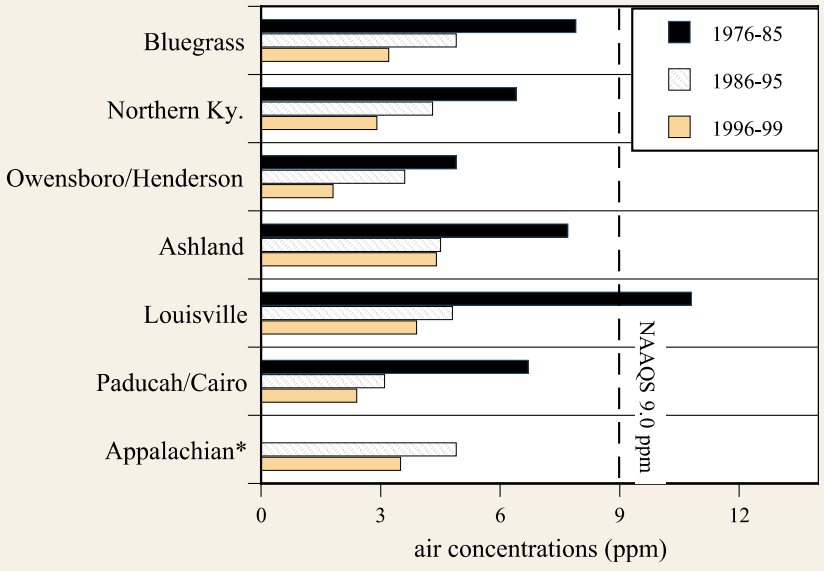
National concerns, however, regarding the use of reformulated gasoline were raised after MTBE (methyl tertiary butyl ether)—one of two fuel oxygenates used in reformulated gas to help improve air quality—was detected in groundwater. The U.S. Environmental Protection Agency (EPA) classifies MTBE as a possible human carcinogen. Reformulated gasoline is used in Louisville and in Northern Kentucky. State environmental officials note, however, that MTBE is not considered a problem in Kentucky due to the nature of the state's soils and geology, the lack of widespread use of MTBE in the state, and stringent cleanup standards for leaking underground storage tanks. According to an assessment conducted by the Kentucky Department for Environmental Protection, MTBE has been detected at seven (5.2 percent) of the 134 sites sampled in the state's groundwater ambient monitoring network.[2] Tests also revealed MTBE detections at 17 (20 percent) of the 85 lakes sampled and at 10 public drinking water systems. State officials have concluded that MTBE is not a problem in most Kentucky waters, but that the contaminant is of public concern and warrants continued monitoring.

At a Glance

Number of Kentucky counties in compliance with CO standard. . . 120

Leading sources of CO emissions in Kentucky (1998)
highway vehicles. . . 68%
off-highway 16%
fuel combustion. 7%

Measure 1. Regional Air Concentrations of Carbon Monoxide in Kentucky



Footnotes

1. NET Tier Report, Airsdata (1998), U.S. Environmental Protection Agency, 2000.

2. MTBE: Summary of Program Sample Analyses, Feb. 15, 2001, Ky. Department for Environmental Protection.

Measures - notes and sources

***Measure 1**. NAAQS - National Ambient Air Quality Standard. *Less than ten years of data available for 1986-95. Based on second maximum 8-hour average. Source: Ky. Division for Air Quality.*

Particulates

Indicator 7. Particulate Matter

At a Glance

Number of counties in compliance with PM_{10} standard. 120

Principal sources of PM_{10} emissions in Kentucky (1998)
fugitive dust. 40%
agriculture/forestry. 12.4%
residential wood combustion 9.7%
open burning. 7.5%

Principal sources of $PM_{2.5}$ emissions in Kentucky (1998)
fugitive dust. . . .60.8%
agriculture and forestry. 20%
residential wood combustion 3%
open burning. 2.4%

Background Particulates are small particles of dust, dirt, chemicals and soot in the air. Concerns about the impacts of particulates on public health prompted the U.S. Environmental Protection Agency (EPA) to issue a PM_{10} standard in 1987 to control particulates that are 10 microns in diameter or smaller. Health effects from exposure to PM_{10} include breathing and respiratory problems, cancer and premature death. The elderly, children and people with chronic lung disease are especially sensitive to particulate matter.

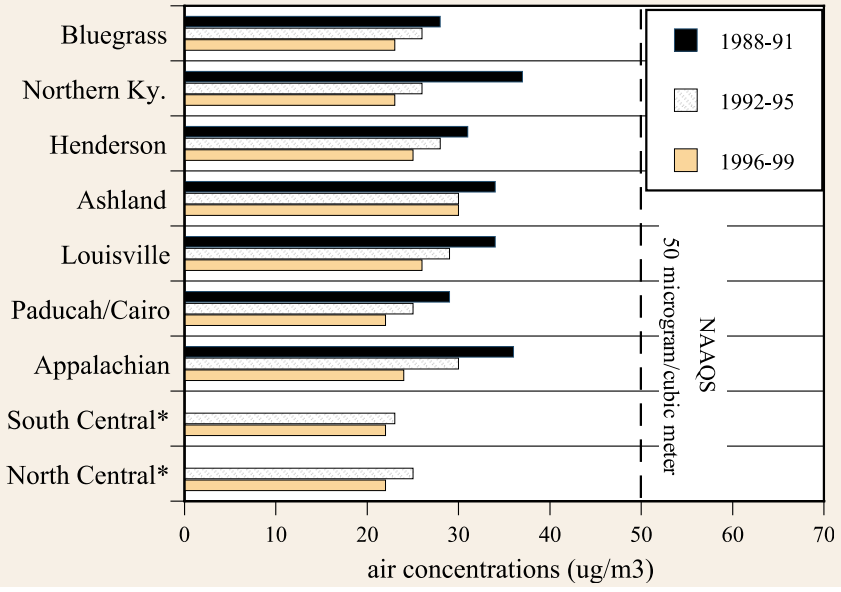
In 1997, the U.S. EPA issued new health-based standards for particulates less than 2.5 microns in diameter. Based on new health studies, these smaller particulates can be inhaled more deeply into the lungs than PM_{10} particulates. The new $PM_{2.5}$ standard along with the 8-hour ozone standard were challenged by the American Trucking Association, the U.S. Chamber of Commerce and other state and business groups who claimed the U.S. EPA misinterpreted the Clean Air Act in regard to setting air standards. In Feb. 2001, the Supreme Court overturned an earlier circuit court ruling, upholding the rights of the U.S. EPA to set health-based standards and rejecting arguments that the agency must balance the negative health effects of pollution against the economic effects of the regulation.

Particulates are emitted from cars, construction sites, mineral and metal processes, coal-fired power plants, agricultural operations and roads. During 1998, 102,485 tons of $PM_{2.5}$ were emitted and 345,078 tons of PM_{10} emissions were emitted.[1] The largest source was fugitive dust, followed by agriculture and forestry activities, residential wood fuel combustion and open burning.

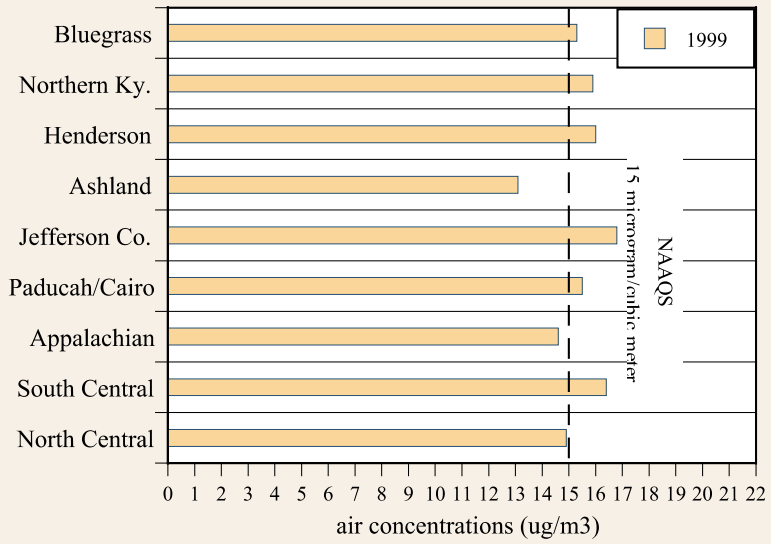
Goal Implement and enforce requirements to meet the national PM_{10} standard of 50 micrograms per cubic meter for particulate matter. Collect data and information using the new federal $PM_{2.5}$ standard for particulate matter less than 2.5 microns in diameter and enforce provisions as required.

Progress Air monitors began measuring particulates based on the PM_{10} standard in 1987. All regions of the state currently meet the PM_{10} standard. In 1999, 22 new $PM_{2.5}$ monitoring

Measure 1. Regional Air Concentrations of Particulates (PM_{10}) in Kentucky



Measure 2. Regional Air Concentrations of Particulates ($PM_{2.5}$) in Kentucky



stations in 18 counties began measuring compliance with the new $PM_{2.5}$ standard. Monitoring data reveals problems meeting the standard in six of the state's nine air quality control regions. The highest $PM_{2.5}$ levels were found in the Jefferson County.

Footnotes

1. NET Tier Report, Airsdata (1998), U.S. Environmental Protection Agency, 2000.

Measures - notes and sources

***Measure 1**.*Data prior to 1992 not collected. Based on annual arithmetic mean. Source: Ky. Division for Air Quality.*

***Measure 2**. Data collection for $PM_{2.5}$ began in 1999. *1999 data does not meet quality assurance requirements, which prohibits its use for regulatory purposes, but it can be used for planning purposes. Source: Ky. Division for Air Quality.*

Enforcement and Compliance

Indicator 8. Enforcement and Compliance

At a Glance

Air pollution sources regulated in Kentucky
. 3,667

Number of air pollution inspections
1995 5,000
1999. 6,086

Air quality complaints
1995 2,572
1999. 2,407

Air pollution violations
1995. 1,001
1999 964

Air pollution sources assessed penalties
1995 333
1999 96

Air pollution penalties
1995. . . . . .$1,056,500
1999 . . . . . .$830,855

Background The Kentucky Division for Air Quality is the principal agency responsible for monitoring and implementing clean air regulations in the state. In addition, the Jefferson County Air Pollution Control District was created in 1952 and was approved in 1970 by the U.S. Environmental Protection Agency (EPA) to implement the provisions of the Clean Air Act for Jefferson County and metropolitan Louisville.

The Division for Air Quality currently regulates 2,336 industrial and commercial sources of air pollution, while the Jefferson County Air Pollution Control District regulates 789 facilities and 542 service stations. During 1999, the Division for Air Quality conducted 4,185 inspections, while the Jefferson County Air Pollution Control District conducted 1,901 routine inspections of permitted facilities or inspections in response to a complaint.

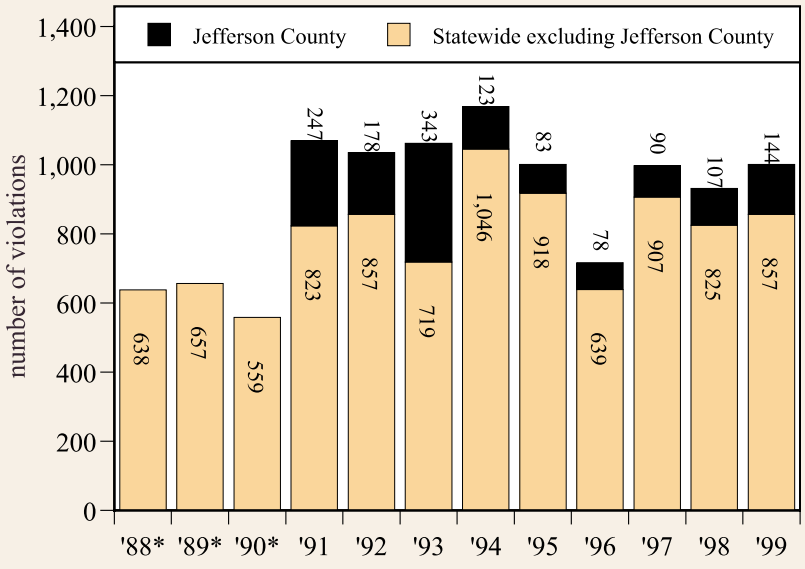
Goal Ensure air pollution control requirements are met by enforcing air quality regulations, permits and enforcement actions.

Progress In 1999, 857 violations of air quality rules were cited by the Kentucky Division for Air Quality (276 at permitted facilities, 518 at area sources, and 63 asbestos violations). These include administrative actions as well as violations of permit limits. The Jefferson County Air Pollution Control District issued 107 notices of violation in 1999 (34 at permitted facilities, 34 at gas stations, 11 for open burning and 28 asbestos and other sources).

Some of the violations cited were the result of complaint investigations. In 1999, 1,675 air quality complaints were received by the Kentucky Division for Air Quality while 760 complaints were received by the Jefferson County Air Pollution Control District. The greatest percentage of complaints received by the Division for Air Quality concerned odor (37 percent), which was followed by dust (28 percent), open burning (25 percent), asbestos (4 percent) and other sources such as fumes, vapor, noise and dumping (6 percent).

Many violations cited by the Kentucky Division for Air Quality are resolved at the regional office level without the assessment of penalties, but some violations result in formal referral to the Frankfort Central Office for penalty assessment. In 1999, the state assessed penalties in

Measure 1. Air Quality Violations Cited in Kentucky



Measure 2. Air Quality Penalty Assessments in Kentucky

Year	State ($)*	Jeff. Co. ($)**
1990	126,500	N/A
1991	1,698,375	N/A
1992	N/A	282,000
1993	847,425	377,000
1994	366,650	N/A
1995	976,500	80,000
1996	1,208,247	35,000
1997	507,450	45,000
1998	850,431	44,220
1999	761,950	68,925
2000	579,500	81,615

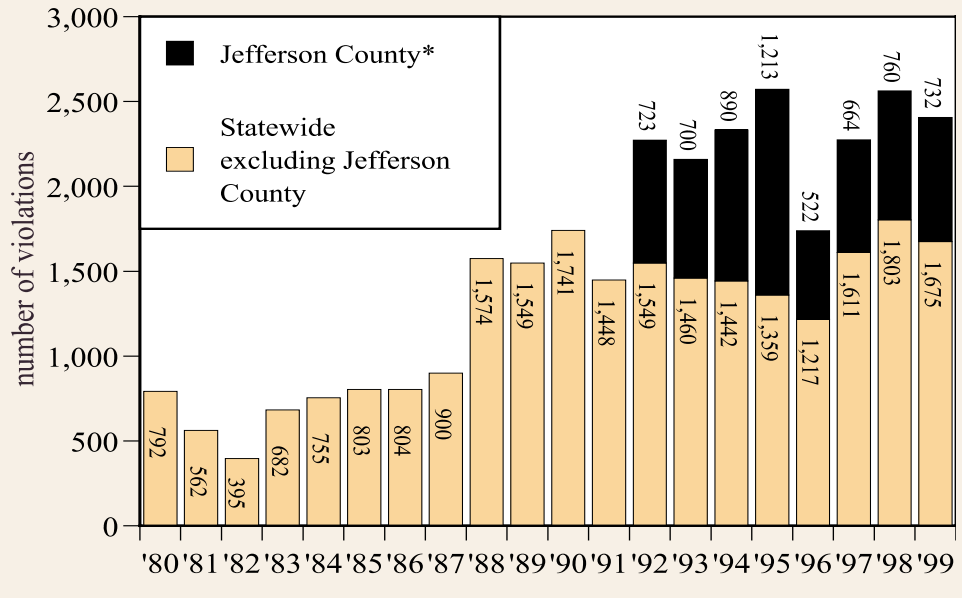
the amount of $761,950 against 15 industrial facilities, 10 commercial contractors, eight individuals, five businesses, three government/public facilities and three schools. The Jefferson County Air Pollution Control District assessed 83 penalties against 52 sources. The Division for Air Quality also worked to resolve violations through the use of Supplemental Environmental Projects (SEPs). During 1999, 10 SEPs were implemented by responsible parties to mitigate $163,400 in penalties. Recent projects included placing ads in newspapers regarding open burning, cleaning up dumps, attending asbestos training, and the installation of pollution control equipment beyond what is required by state regulations.

Measures - notes and sources

***Measure 1**. 1990 statewide data not available. Includes all violations cited by the Ky. Division for Air Quality. *Jefferson County data not available. Source: Ky. Division for Air Quality, Jefferson County Air Pollution Control District.*

***Measure 2**. N/A – data not available. *Calendar year. **Federal fiscal year. Source: Ky. Division for Air Quality, Jefferson County Air Pollution Control District.*

Measure 3. Air Quality Complaints in Kentucky



Ozone Depletion

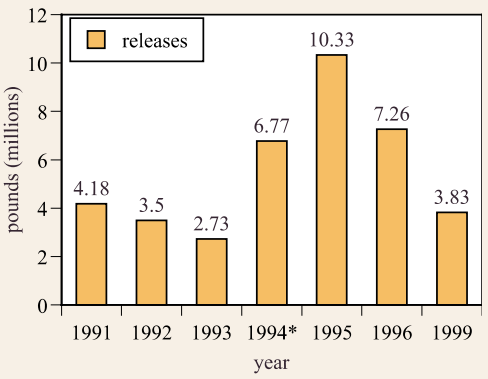
Indicator 9. Ozone Depletion

At a Glance

Generation of ozone depleting chemicals in Kentucky (million pounds)
1991. . . . . 4.18
1995. . . . . 10.33
1999. . . . . 3.83

Background The earth's stratospheric ozone layer protects against the sun's harmful ultraviolet (UV) rays, but human activities have damaged this shield. While ozone concentrations vary naturally, scientists have found that the ozone shield is being depleted well beyond changes due to natural processes. A diminished ozone layer allows more radiation to reach the earth's surface. For people, overexposure to UV rays can lead to skin cancer, cataracts, and weakened immune systems. Increased UV rays can reduce crop yields and disrupt the marine food chain. In the early 1970s scientists began investigating the effects of various chemicals on the ozone layer, particularly chloroflorocarbons (CFCs), which contain chlorine. CFCs are used as refrigerants, solvents, and blowing agents. Other chlorine-containing compounds include methyl chloroform, a solvent, and carbon tetrachloride, an industrial chemical. When CFCs reach the stratosphere, the radiation from the sun causes them to break apart and release chlorine atoms which react with ozone, starting the chemical cycle of ozone destruction. Similarly, when halons (fire extinguishing agents) and methyl bromide (a soil fumigant) are broken apart, they release bromine atoms, which are 40 times more destructive to ozone molecules than chlorine atoms.

Measure 1. Generation of Ozone Depleting Chemicals in Kentucky



Measure 2. Top 10 Companies Releasing Ozone Depleters

Company (County)	Releases (lbs) 1996	1999
DuPont, Louisville Plant (Jefferson)	3,907,778	1,869,560
Atofina Chemicals Inc. (Marshall)	2,226,870	469,378
GE Appliancess (Jefferson)	317,000	433,760
U.S. Enrichment Corp. (McCracken)	176,750	382,000
Louisville Packaging (Jefferson)	123,600	330,669
Firestone Abuilding Prod. (Kenton)	123,170	156,371
Topy Corp. (Franklin)	105,016	113,750
Arch Chemicals Inc. (Meade)	68,718	59,731
Westlake Monomers Corp. (Marshall)	51,655	6,800
Hendrix & Dail Inc. (Franklin)	45,400	2,100
Total top 10	7,145,957	3,824,119
Total State	7,257,430	3,826,336

Goal Phase out production of CFCs and other ozone depleters as specified in the Montreal Protocol.

Progress The *Montreal Protocol on Substances that Deplete the Ozone Layer* was adopted by the United Nations Environment Program in 1987. Since then, 175 nations have ratified the protocol.[1] The Protocol's chief aim is to reduce and eventually eliminate the production and use of man-made ozone depleting substances. As part of the United States' commitment to implementing the Montreal Protocol, the U.S. Congress amended America's Clean Air Act, adding provisions for the protection of the ozone layer. Most importantly, the amended Act required the gradual end to the production of chemicals that deplete the ozone layer.[2]

Data from the 1999 Toxic Release Inventory report revealed that 15 companies in Kentucky released 3.83 million

pounds of ozone-depleting chemicals. Four ozone depleting chemicals accounted for almost 96 percent of the reported air releases in Kentucky (HCFC-22, HCFC-141b, CFC-114, and HCFC-142b). As was the case in previous years, Kentucky reported more on-site releases of ozone depleters in 1999 than any other state in the nation. DuPont's Louisville Plant accounted for 49 percent of the total ozone-depleting releases reported in the state during 1999. However, the generation of ozone depleting chemicals in Kentucky is declining. In 1996, 21 Kentucky companies released 7.25 million pounds of ozone-depleting chemicals, more than twice the amount that was emitted in 1999.

Footnotes

***1**. Status of Ratification/Accession/Acceptance/Approval of the agreements on the protection of the stratospheric ozone layer, United Nations Environment Program, April, 9, 2001.*
***2**.* "What has EPA done about ozone depletion? And why does the U.S. need regulations to protect the ozone layer?," U.S. EPA, Web site - http://www.epa.gov/ozone/geninfo/actions.html.

Measures - notes and sources

***Measure 1**. Chemical transfers are those chemicals transferred for treatment or recycling. *Chemical releases and transfers of four new chemicals required to be reported in 1994. Source: Toxics Release Inventory Reports, U.S. EPA.*
***Measure 2**. Based on 1999 data. Source: U.S. EPA.*
***Measure 3**. Source: U.S. EPA.*

Chapter 4

Waste Management

WASTE MANAGEMENT

SOLID WASTE GENERATION

Indicator 1. Solid Waste Generation and Disposal

Background National data reveal that Americans continue to dispose of a significant amount of garbage. Nationwide, the amount of municipal solid waste disposed at landfills increased from 88.1 million tons in 1960 to 382 million tons in 2000.[1] During 1999 the national per capita municipal solid waste disposal rate was 6.1 pounds per person per day.[2] In Kentucky, per capita garbage disposal is estimated at 5.5 pounds per person per day in 1999.

Municipal solid waste includes durable goods, nondurable goods, containers, food scraps, yard waste and miscellaneous wastes from residential, commercial and industrial sources. Most of the solid waste generated is paper, comprising 38 percent of the waste stream, followed by yard waste (13 percent), food waste (10 percent), plastics (9 percent), metals (8 percent), glass (6 percent), wood (5 percent) and other (10 percent), according to U.S. EPA 1996 estimates.

Goal Reduce the weight of municipal solid waste disposed of at municipal landfills by a minimum of 25 percent by July 1, 1997, using fiscal year 1993 as a base year per KRS 224.43-010.

Progress In fiscal year 1999, 4.87 million tons of waste was disposed of at solid waste municipal landfills in Kentucky. Of this total, 4.059 million tons were classified as municipal household and commercial waste, and 815,947 tons were industrial solid waste. Of the 4.87 million tons of waste disposed of at solid waste landfills, 536,520 tons (11 percent of the total disposed) were imported from out-of-state, most of which was from neighboring states.

Kentucky has seen the amount of municipal waste disposed of at municipal solid waste landfills increase since 1993. This is attributed to an increase in the number of households participating in a garbage collection system as well as the cleanup of hundreds of illegal dumps in the Commonwealth. Therefore, Kentucky has not met its 25 percent waste reduction goal. In fact, the amount of municipal garbage disposed of at landfills during 1999 increased 27 percent over 1993 levels.

At a Glance

Pounds of municipal garbage disposed per person per day
U.S 6.1
Kentucky 5.5

Sources of municipal solid waste
paper. 38%
yard waste 13%
food waste 10%
plastic 9%
metal 8%
glass 6%
wood 5%
other 11%

Tons of garbage disposed of at Kentucky landfills
1993. . 3.83 million tons
1999. . 4.87 million tons

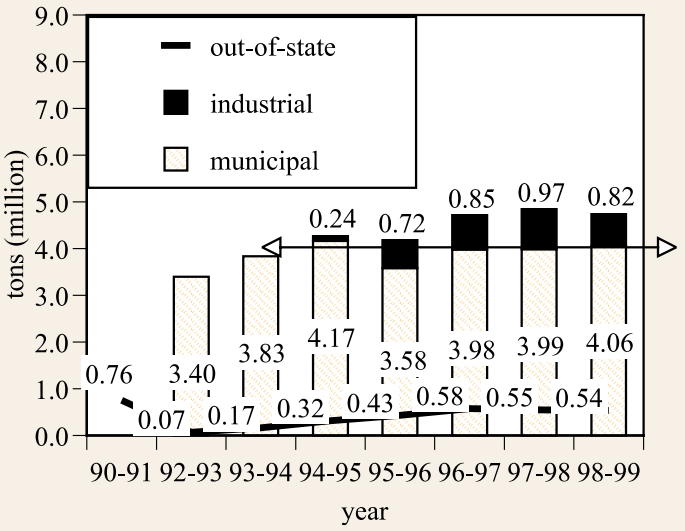
Footnotes

1. "State of Garbage in America," BioCycle, November 2000.
2. Estimate based on 229,556,400 tons of municipal solid waste landfilled in the United States during 1999. Source: BioCycle, November 2000.
3. Based on 4.06 million tons of municipal solid waste disposed at landfills in 1998-99 using the population of 4,041,769.

Measures - notes and sources

Measure 1. *FY - fiscal year. 1990-91 data not available for total waste disposed. Industrial waste data not available for 1992-93 and 1993-94. Out-of-state waste is included in industrial and municipal waste totals. Source: Ky. Division of Waste Management.*

Measure 1. Disposal of Solid Waste at Municipal Solid Waste Landfills in Kentucky



MSW Landfills and Capacity

Indicator 2. Municipal Solid Waste (MSW) Landfills and Capacity

At a Glance

MSW landfills
operating 26
under construction . . 6

MSW landfill capacity
years 17
tons. . . . . 87 million

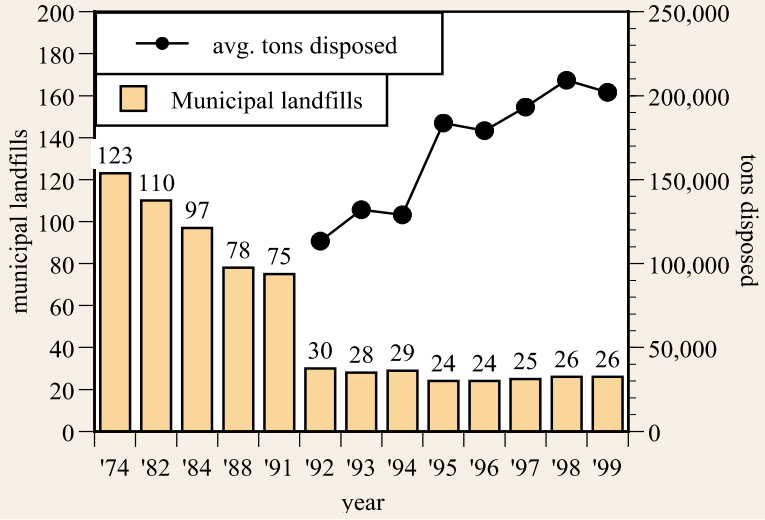
Closed landfills
number 56
with groundwater monitoring 41
with contamination 20

Background Kentucky began regulating solid waste disposal in 1969. At that time there were hundreds of landfills and thousands of open dumps which posed public health and environmental threats. Solid waste issues moved to the forefront of the state's environmental agenda in 1987, after Kentucky was targeted for solid waste disposal by firms in the Northeastern United States, where landfill capacity was virtually nonexistent. This issue, combined with the fact that many landfills were leaking contaminants into ground and surface waters, led to the passage of a state law in 1991 to close substandard landfills, better plan and develop state-of-the-art landfills and ensure the proper disposal of solid waste.

Municipal solid waste (MSW) landfills are operated by private companies, cities, counties or groups of counties. In addition to the 26 active municipal solid waste landfills in Kentucky, construction permits have been approved for six more.

Goal Provide for the management and disposal of waste in a manner that will protect the public health and welfare; prevent the spread of disease and creation of nuisances, conserve our natural resources; enhance the beauty and quality of our environment; and encourage a regional approach to solid waste management.

Measure 1. Municipal Solid Waste Landfills in Kentucky



Progress Solid waste laws and regulations enacted in 1991 and 1992 have led to the closure of 56 of the state's 75 MSW landfills. These closed landfills must monitor groundwater for a two-year period and install a leachate collection system (a system to collect and treat liquids leaching from the landfill) if contamination is detected. Groundwater monitoring systems have been installed at 41 of the closed MSW landfills. Twenty have confirmed groundwater contamination.

Kentucky now has 26 state-of-the-art regional MSW landfills. These landfills must meet stringent construction and operating standards including plastic and clay composite liners (24 landfills) or double composite liners (2 landfills), leachate recovery and the use of a comprehensive system to monitor groundwater for up to 75 different parameters. The 26 MSW landfills are permitted to provide for an estimated 17 years of capacity (approximately 87 million tons or 117 million cubic yards of air space).

The cost to dispose of a ton of waste at landfills (the tipping fee) has increased since the passage of the 1991 solid waste law, when stricter construction and operation standards for MSW landfills took effect. Trends reveal that tipping fees have leveled out during the past four years (1996-1999).

Measure 2. Average MSW Landfill Tipping Fees in Ky.

Year	Tipping Fee (per ton)
1993	$21.69
1994	$23.49
1995	$24.43
1996	$27.49
1997	$27.50
1998	$27.90
1999	$26.44

Measures - notes and sources

Measure 1*. Contained permitted municipal solid waste landfills. Source: Ky. Division of Waste Management.*

Measure 2. *Source: National Solid Waste Management Association, Ky. Division of Waste Management.*

WASTE MANAGEMENT

Indicator 3. Solid Waste Management Facilities

Background In addition to municipal solid waste landfills, Kentucky has other waste management facilities, including 224 construction/demolition debris (CDD) landfills, 23 residual landfills, 68 landfarms and 11 special waste landfills. There are also 177 transfer stations operating in Kentucky which serve as a central location for waste shipping purposes.

Each of these solid waste management facilities receives various types of waste and has different monitoring and closure requirements. CDD landfills are designed to receive construction and demolition debris or other inert waste. Residual landfills are operated by industries to dispose of solid waste by-products from the manufacturing process. Special waste landfills are designed to dispose of high-volume, low-hazard wastes such as mining waste or fly ash generated by power plants. Landfarms are operations that apply solid waste such as biosolids (wastewater treatment sludge) or special waste to the land.

Goal Ensure proper construction, operation and closure of solid waste management facilities to protect public health and welfare, prevent the spread of disease and creation of nuisances, conserve natural resources, and enhance the beauty and quality of the environment.

Progress The number of CDD landfills continues to increase in Kentucky. CDDs less than one acre are exempt from groundwater monitoring and reporting requirements. Of the 224 CDDs, 198 are less than one acre. During fiscal year 1999, 648,667 tons of waste were disposed of at the 26 CDD landfills greater than one acre, three of which had groundwater contamination problems.

In 1999, 814,088 tons of waste were disposed of at the 28 residual landfills operating in the state. All residual landfills are monitoring groundwater and none have confirmed contamination.

Special waste landfills have increased in Kentucky from three in 1993 to 11 in 1999. In 1999, 2.28 million tons of waste were reported disposed of at special waste landfills. Two of the 11 special waste landfills have confirmed groundwater contamination.

Of the 68 landfarm operations permitted to operate in Kentucky, three are required to monitor groundwater and one has detected contamination.

Solid Waste Management Facilities

At a Glance

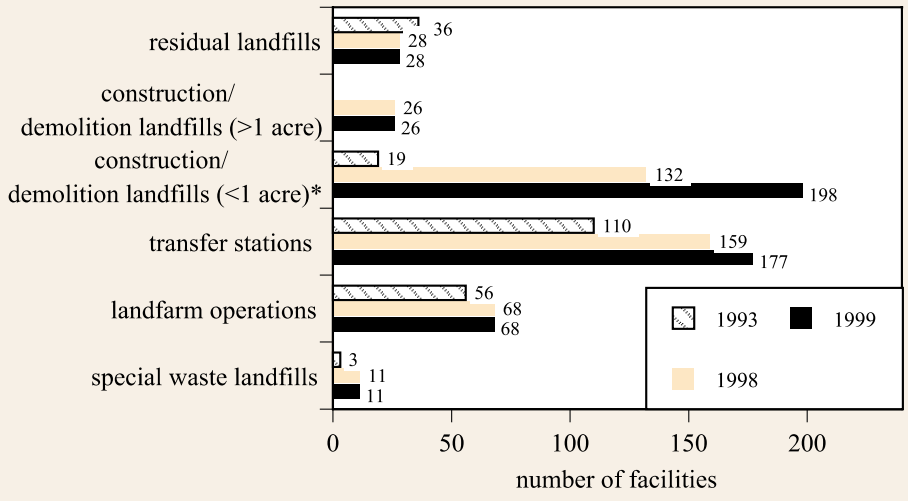
Solid waste management facilities
CDD landfills 224
residual landfills . . 23
landfarms. 68
special waste 11
transfer stations. .177

Solid waste management facilities with groundwater contamination
CDD landfills. 3
special waste 2
landfarms. 1

Measures - notes and sources

Measure 1. **1993 data is for all construction and demolition debris landfills (less than one acre and larger). Source: Ky. Division of Waste Management.*

Measure 1. Solid Waste Management Facilities in Kentucky



Garbage Collection

Indicator 4. Garbage Collection

At a Glance

Percent of Kentuckians participating in garbage collection
door-to-door. 80%
collection stations. . 4%

Estimated amount of garbage disposed of illegally in Kentucky. . . . . 1.5 million lbs. day

Number of counties with mandatory garbage collection ordinances
2000. 28

Average monthly garbage collection fee
1994 . . . . . .$9.64
1999 . . . . . $10.58

Background Garbage collection has long been a challenge in Kentucky. In 1991, only 14 counties offered residents door-to-door garbage collection services. Illegal disposal of garbage prompted the state to adopt a universal collection law in 1990 to help curb open dumping. As a result, 109 counties now have door-to-door as their primary means of garbage collection. However, while the law specifies that counties must provide garbage collection services, it does not mandate participation.

Goal Provide for county universal garbage collection programs by July 1, 1994. The collection programs can be door-to-door, direct-haul to a staffed convenience station, or other alternatives approved by the Natural Resources and Environmental Protection Cabinet.

Progress The primary responsibility for municipal waste collection rests with county governments. Each county has developed ordinances and plans detailing a comprehensive approach to collecting, disposing and reducing solid waste. However, most ordinances are voluntary in nature. To date, only 28 of 120 counties have passed mandatory garbage collection ordinances.

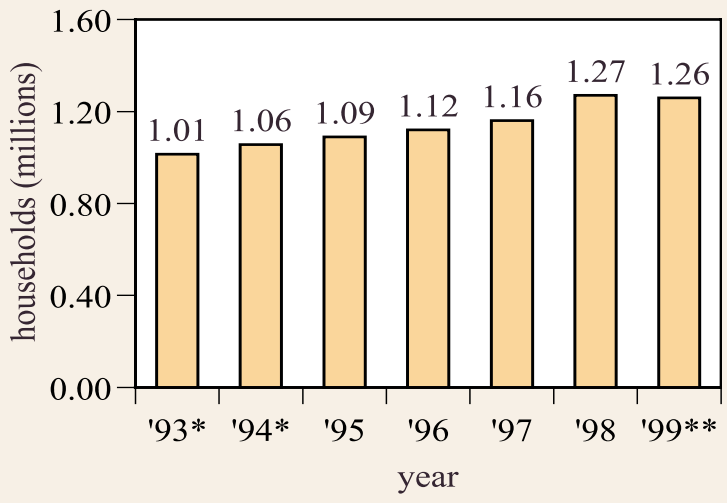
County solid waste reports for 1999 indicate that an estimated 1.26 million households, 80 percent of the state total, participated in a door-to-door garbage collection system. Another 4 percent of the population disposed of its garbage at a collection station, transfer station or convenience center. Data provided by counties reveal an increase of 100,000 households participating in door-to-door garbage collection since 1997.

Garbage collection participation rates vary greatly by county, with 11 counties (Boyle, Grant, Greenup, Hopkins, McCracken, Marshall, Nelson, Owen, Perry, Pike and Todd) reporting 100 percent participation to a low of 22.3 percent participation in Knox County.

During 1994, the average residential garbage collection fee was $9.69 a month. However, when adjusted for inflation (using the Consumer Price Index for 1999), the 1994 fee was $10.89 compared to the 1999 of $10.58 a month, indicating a reduction in garbage collection fee in terms of real dollars.

It is not known how the remaining 16 percent of households disposed of an estimated 3.5

Measure 1. Kentucky Households Participating in Door-to-Door Garbage Collection

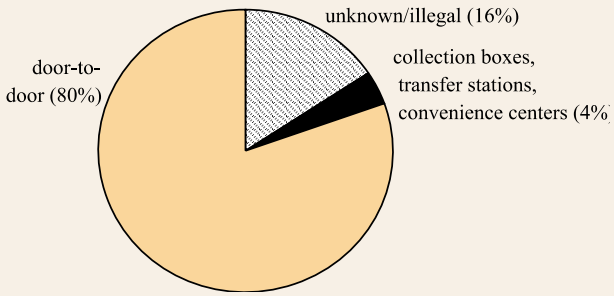


million pounds of garbage a day, since there is no statewide system in place to track disposal methods other than door-to-door collection.[1] Some of this waste may be properly disposed of, however an estimated seven percent (1.5 million pounds per day is illegally dumped).

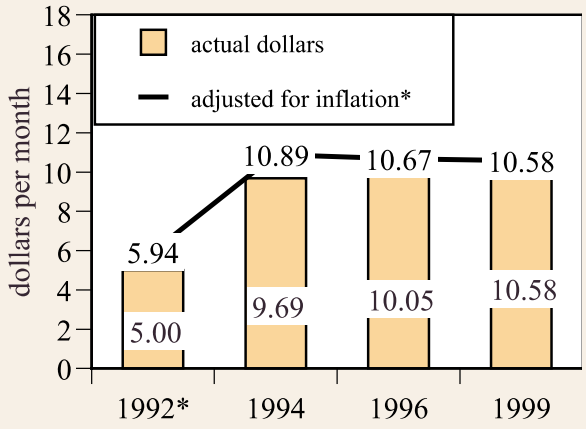
Legislation to require mandatory solid waste collection was considered in the 2001 legislative session. The bill, supported by Gov. Patton, received the support of the House but failed to gain approval in the Senate. Additional legislative measures to require deposits on beverage containers and assess an environmental impact fee on fast food containers also failed to win support.

The Natural Resources and Environmental Protection Cabinet is currently developing a statewide solid waste strategy to focus on garbage collection, recycling and education. In addition, the Certified Clean Community Program created by the governor in 2001 to help fund open dump cleanups for those counties who implement mandatory garbage collection.

Measure 2. Status of Garbage Collection in Kentucky (1999)



Measure 3. Average Monthly Residential Garbage Collection Fees in Kentucky



Footnotes

1. Based on 16 percent of Kentucky's population (646,683) disposing of an average of 5.5 pound of municipal solid waste per day.

Measures - notes and sources

***Measure 1**. *Data represents total collection - door-to-door collection data not available. **Decline in households participating in door-to-door garbage collection between 1998 and 1999 is attributed to reporting discrepancies by counties, according to the Ky. Division of Waste Management. Source: Ky. Division of Waste Management, County Solid Waste Reports.*

***Measure 2**. *Based on an estimated 1,571,588 households. Source: Ky. Division of Waste Management, State Data Center.*

***Measure 3**. *Adjusted for inflation using the average consumer price index for 1999. Source: Ky. Division of Waste Management, County Solid Waste Reports.*

Open Dumps

Indicator 5. Open Dumps

At a Glance

Number of open dumps in Kentucky 3,300

Violations cited for illegal dumping and littering (1999)
state 563
county 4,145

Number of open dumps cleaned
1995 1,761
1997 3,043
1999 2,304

Cost to cleanup open dumps (1999)
. . . . . $6.3 million

Background Each and every day, tons of garbage are illegally dumped in rivers, down hillsides and along roads, polluting the environment and despoiling the beauty of Kentucky's landscape. While the exact amount of garbage illegally disposed of is unknown, thousands of open dumps attest to the fact that illegal dumping remains a considerable problem in the Commonwealth.

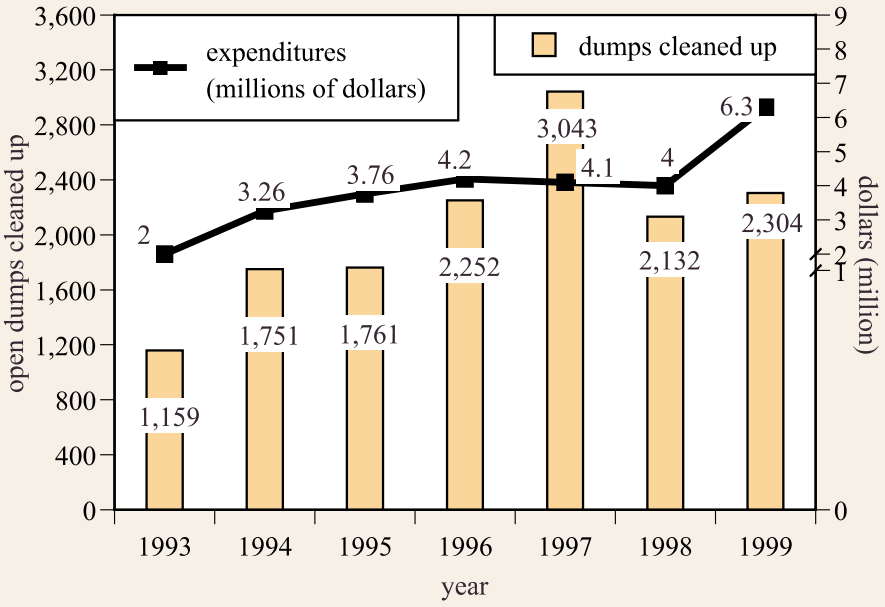
An estimated 84 percent of the state's households participated in some type of garbage collection in 1999. It is not known how the remaining 16 percent disposed of an estimated 3.5 million pounds of garbage a day. Some of this waste may have been hauled to a collection station or landfill, however, an estimated seven percent (1.5 million pounds per day) is illegally dumped.

Goal To encourage state and local governments, business, industry, civic groups, environmental groups and citizens to work together to clean up Kentucky and to educate citizens about the importance of proper garbage disposal.

Progress The state has made impressive gains during the past few years in cleaning up open dumps. In 1996, the Natural Resources and Environmental Protection Cabinet (Cabinet) initiated a campaign to stop illegal dumping. The Cabinet joined other agencies to promote greater public awareness of the threats posed by illegal dumping and to step up enforcement of open-dump laws. A statewide toll-free hotline (1-888-NO-DUMPS) was established in April 1996 to provide Kentuckians an opportunity to report open dumps. More than 3,000 complaints have since been logged on the report-a-dump hotline.

As a result of the state campaign and the efforts of local solid waste management officials and other organizations such as PRIDE (an eastern Kentucky organization established to promote positive environmental action), 2,304 open dumps were reported cleaned up in 1999. That year, county officials issued 4,145 citations for illegal dumping, littering and failure to

Measure 1. Open Dump Cleanups and Expenditures in Kentucky



participate in mandatory garbage collection systems. Of the 4,145 citations, 999 resulted in court actions. Fayette County led the state with 2,172 citations issued in 1999, followed by Jefferson County with 619 citations.

The Cabinet has inspected 3,887 illegal dumps and issued 3,075 notices of violation since 1997, resulting in violators cleaning up 1,063 illegal dumps. Since December 1997, the Cabinet has also placed video surveillance equipment at 92 illegal open dumps and has recorded 109 instances of people illegally disposing of waste. This initiative has resulted in 63 notices of violation, $50,000 in fines, and orders to pick up and dispose almost 200 tons of garbage. However, the Cabinet estimates that at least 3,300 dumps still exist in Kentucky, and more are discovered every day. During the year 2000, the state received 620 illegal dump complaints.

Many counties have hired solid waste coordinators to promote proper solid waste management. Counties with solid waste coordinators have steadily increased—from 40 in 1992, 88 in 1995, to 102 in 1999. Ninety counties have also enacted open dump ordinances to give local officials authority to cite and prosecute violators.

State efforts to address the problem of waste tires continue. Each year, Kentuckians produce 3.8 million waste tires. In 1998, the state spent $2.6 million to clean up seven waste tire piles containing an estimated 2.8 million tires. During 1999, another $1.12 million was spent to clean up 11 tire piles containing 457,092 tires. The General Assembly passed House Bill 636 in 1998 to strengthen the state's waste tire program. A $1 fee for each new tire purchased is used to clean up tire piles and prevent new ones. A major initiative of the program is county-based tire amnesty programs to collect waste tires on a onetime basis free of charge from individuals, farmers and small businesses. By 2002, all counties will hold waste tire amnesty days. In 1998, five counties held amnesty days and collected 43,915 waste tires. In 1999, 22 counties held amnesty days and collected 734,603 tires. In the year 2000, 45 counties hosted amnesty days and collected 2.4 million tires. The tire fee will expire on July 31, 2002.

County and state programs spend an estimated $8 million a year to address roadside litter. A statewide cleanup initiative, entitled Commonwealth Cleanup Week, was established by the legislature in 1998 to promote community involvement in cleaning up roadsides and open dumps. Commonwealth Cleanup Week netted 106,000 bags of trash in 1999 and 2000 and involved more than 36,000 volunteers. Efforts to pass a bottle bill to tackle the litter problem in Kentucky failed to gain support in the 2000 and 2001 legislative sessions.

Measures - notes and sources

Measure 1. *Source: Ky. Division of Waste Management, County Solid Waste Reports.*

Recycling

Indicator 6. Recycling Solid Waste

At a Glance

Recycling rate
U.S. 28%
Kentucky . . . . . unknown

Tons of recyclable materials collected in Kentucky
1994 1,039,534
1999. 1,871,020

Counties with community door-to-door collection of recyclables
1994 4
1999 35

Background Recycling is one of the best environmental success stories of the 20th century. In 1997, the U.S. EPA estimated that 28 percent of the waste generated in the U.S. was recycled, compared to just 16.4 percent in 1990.

However, national recycling rates have fallen for some materials. For example, the nationwide plastic bottle recycling rate fell to 22.1 percent in 1999, compared to 23.5 percent in 1998, according to the American Plastics Council. While more plastic was collected for recycling in 1999 (1.15 billion pounds), it was dwarfed by even larger increases in the amount of plastic bottles sold (6.84 billion pounds). The American Forest and Paper Association reports that 45 percent of paper and paperboard was recovered in 1999—an all-time high spurred by the cellulose insulation industry. The industry's goal is to recover 50 percent of all paper Americans consume. The group also reports the recycled paper accounted for 36 percent of total fiber consumption in 1999.

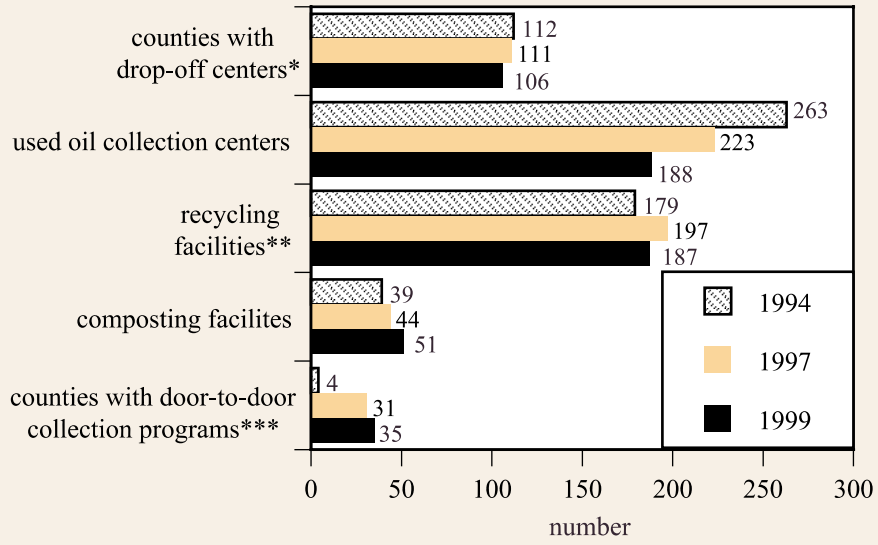
Goal Kentucky does not have a specific recycling goal although it does have a goal to reduce the weight of municipal solid waste disposed of at municipal landfills by a minimum of 25 percent by July 1, 1997, using fiscal year 1993 as a base year per KRS 224.43-010.

Progress

Public awareness of the need to reduce, reuse and recycle wastes continues to grow. More and more households are recycling their waste. Recycling programs vary throughout the Commonwealth. Most Kentucky residents are now within reach of a recycling collection center. In 1999, 106 counties had recycling drop-off centers, 51 had composting facilities, and 35 counties had communities with door-to-door recycling collection programs.

An estimated 1.8 tons of recyclable materials were collected during 1999, according to county solid waste reports. However, it is not possible to determine how much of this waste was actually recycled since recyclers are not required to report this information to the state. In 1999, counties also reported that 3.3 million waste tires were collected for recycling or

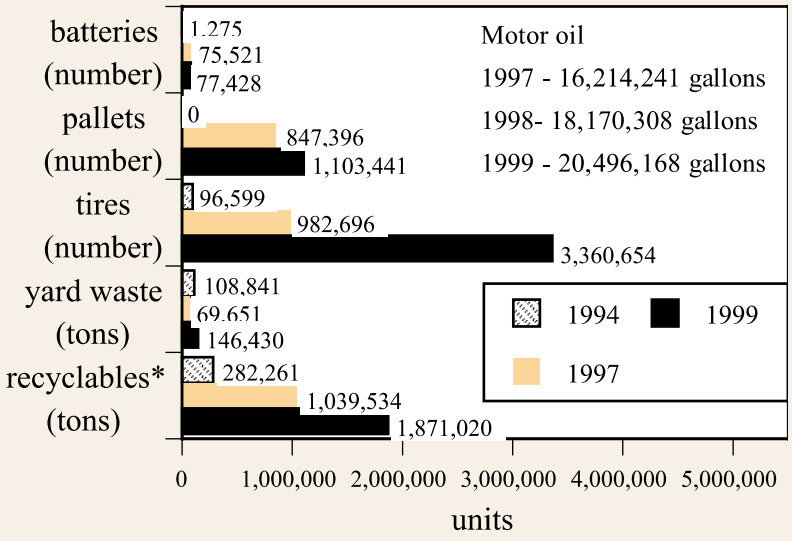
Measure 1. Recycling Facilities and Programs in Kentucky



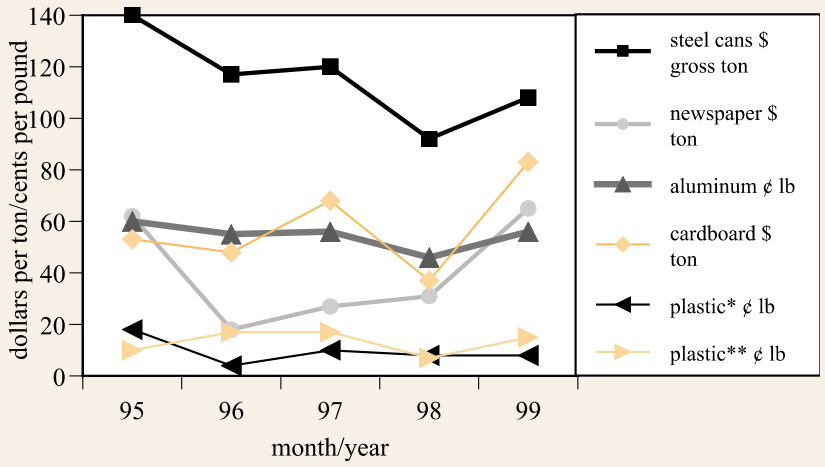
reuse. The increase in the number of tires collected in 1999 is a result of the state's tire amnesty program. That year, the 734,603 tires were collected under the state's tire amnesty program to be beneficially reused (i.e. tire-derived fuel, landfill liners, products) as required by state law.

The recycling market has been unpredictable and cyclical in Kentucky and the nation as indicated in average price trends for various materials. The Kentucky Division of Waste Management formed the Buy Recycled Alliance in 1998 to promote the use of recycled products and strengthen recycling markets in Kentucky. To date, 187 organizations have joined the alliance and have made commitments to buy recycled products.

Measure 2. Collection of Recyclables in Kentucky



Measure 3. Yearly Price Averages of Recyclables in Kentucky



Measures - notes and sources

Measure 1*. *Some counties have more than one drop-off facility. **Total permitted recycling facilities were 124 (those facilities that must separate recyclables from the waste stream). Another 63 facilities operate in Kentucky but are exempt from permitting (those facilities that handle separated materials). ***Counties where one or more communities have door-to-door collection of recyclables.*
Source: Ky. Division of Waste Management.

Measure 2. *Includes data on private and public sector collection where available. *Includes aluminum cans; assorted ferrous and nonferrous metals including white goods; cardboard; newspaper, office and residential paper; glass and plastic. Source: Motor oil data from the Kentucky Used Oil Transporters Annual Report Survey; Ky. Division of Waste Management; County Solid Waste Reports.*

Measure 3. *Yearly averages are for the fiscal year from July 1 through June 30. Not adjusted for inflation. *Polyethylene Terephthlate (PET-soda bottles). **High Density Polyethylene (HDPE-milk jugs). Source: Official Board Markets Yellow Sheet, Recycling Manager, America Metal Market, Ky. Division of Waste Management.*

Solid Waste Enforcement

Indicator 7. Solid Waste Enforcement and Compliance

At a Glance

Number of permitted solid waste facilities
1999 1,026

Inspections
1995 1,233
1999 3,200

Violations
1995 271
1999 723

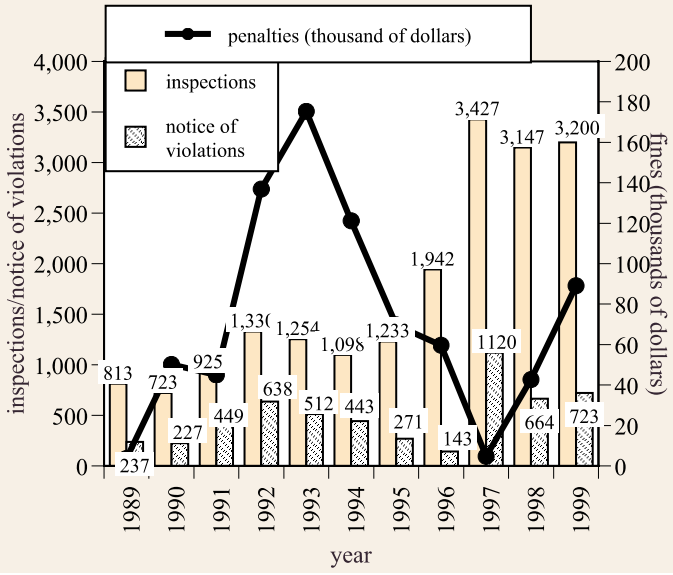
Background Kentucky has passed numerous laws and regulations to ensure the safe disposal of solid waste. But the state still faces numerous solid waste issues—from household garbage collection to ensuring proper operation of landfills and other waste management facilities. Enforcement of solid waste rules provides a good indicator of the state's commitment to carrying out solid waste rules and regulations and ultimately how effective Kentucky is in meeting its waste management goals.

The Kentucky Division of Waste Management regulates 1,026 permitted solid waste facilities. In addition, the state inspectors respond to hundreds of solid waste citizen complaints each year.

Goal Ensure compliance with state and federal solid waste laws and regulations.

Progress Kentucky continues to wage its war against open dumps as part of a 1996 campaign to end illegal disposal of solid waste. In response to that effort, the number of solid waste inspections has increased significantly during the past few years. During 1999, the single largest category of solid waste violations was open dumping, which constituted 78 percent of the 723 violations cited. Solid waste penalties increased during the past two years due to large fines against a few solid waste facilities. For example, during 1998, the Division of Waste Management received payments from a fine totaling $30,000 from a construction and demolition debris landfill case. The division also received large penalty payments ($35,000) related to two landfarm cases.

Measure 1. Solid Waste Enforcement Actions

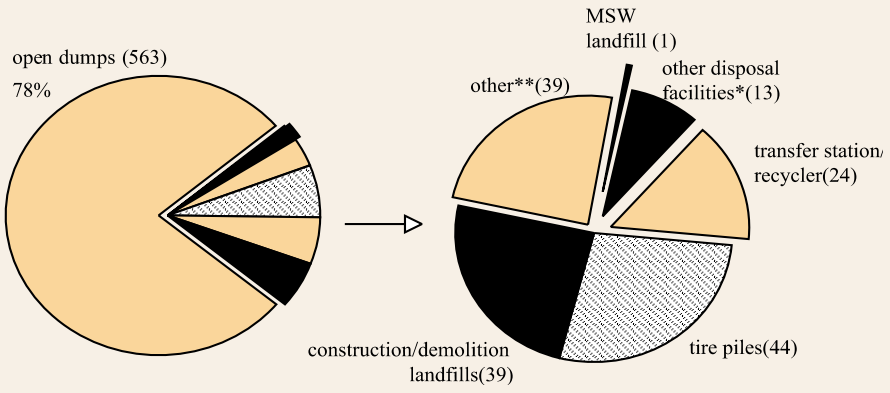


Measures - notes and sources

Measure 1. *Based on penalty collections per year. Source: Ky. Division of Waste Management.*

Measure 2. **Residual landfills, landfarm/compost facilities, convenience centers, other registered sites. **Recyclers, permit-by-rule, road oiling, other. Chart uses revised data from computer system which may differ from previous EQC reports. Source: Ky. Division of Waste Management.*

Measure 2. Solid Waste Violations by Source and Number of Violations



WASTE MANAGEMENT

HAZARDOUS WASTE GENERATION

Indicator 8. Hazardous Waste Generation

Background Hazardous waste has the potential to cause serious health and environmental threats if not managed properly. Hazardous waste is regulated under the federal Resource Conservation and Recovery Act of 1976 (RCRA) and state law. Kentucky assumed authority to carry out the federal hazardous waste permitting and enforcement programs in 1982.

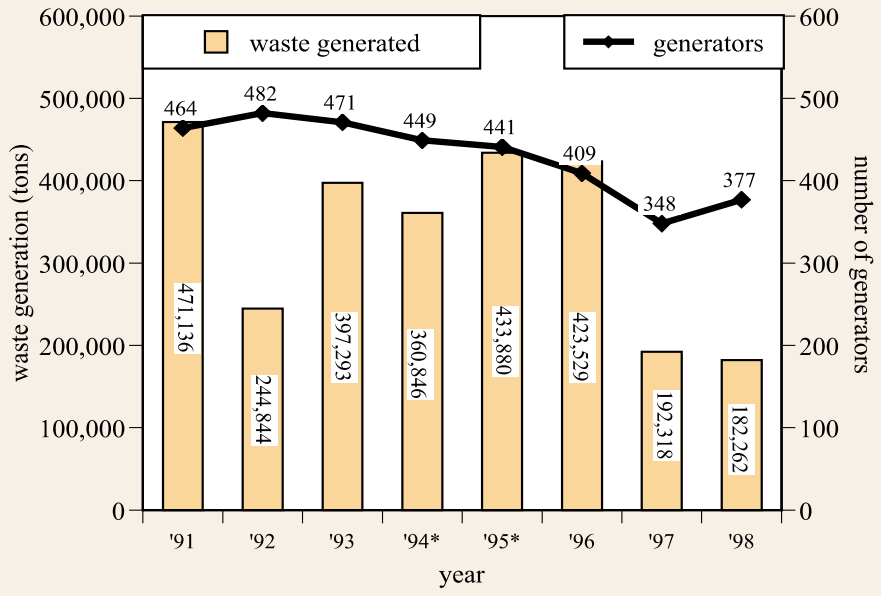
A waste may be classified as hazardous if it exhibits certain characteristics (ignitable, corrosive, reactive or toxic). In addition to these characteristic wastes, a list of over 500 specific hazardous wastes has been developed. Hazardous waste takes many physical forms and may be solid, semisolid, liquid or gas.

The Kentucky hazardous waste program regulates commercial businesses and government facilities that generate, transport, treat, store or dispose of hazardous waste. Each of these entities is regulated to ensure proper management of hazardous waste from the moment it is generated until its ultimate disposal or destruction. Hazardous waste regulations focus on the management of hazardous waste produced by large quantity generators like chemical manufacturers, electroplating companies and petroleum refineries. A large quantity generator is defined as producing 2,200 pounds of hazardous waste in a given month, or 2.2 pounds or more of acutely hazardous waste a month, or 220 pounds of acutely hazardous spill cleanup material in a given month.

Goal Reduce the amount of hazardous waste produced by each generator regulated under KRS 224.46-305 by 25 percent by 1997 and 50 percent by the year 2002, using 1987 as the base year.

Progress In 1998 (the most recent data available from the Division of Waste Management), 377 large quantity generators in Kentucky produced 182,262 tons of hazardous waste that required management in a permitted hazardous waste treatment, storage or disposal facility. These wastes included ignitable wastes such as gasoline, mineral spirits and paint thinners, cleaning solvents and other chemical and toxic wastes. The top 10 generators accounted for

Measure 1. Hazardous Waste Generation in Kentucky



At a Glance

Number of large quantity hazardous waste generators in Kentucky
1995 441
1998 377

Tons of hazardous waste generated in Kentucky
1995. 433,880
1998. 182,262

Top generators of hazardous waste in Kentucky (1998)
Safety Kleen. . . 44,433
Gallatin Steel. . 21,793
Rohm and Haas. 15,494
LWD 12,019

Hazardous Waste Generation

69 percent of the 182,262 tons of waste generated in the state during 1998.

During the past several years (1991-1996) hazardous waste generation in Kentucky has averaged 400,000 tons a year. However, in 1997 and 1998, the generation of hazardous waste dropped by more than half. Though difficult to pinpoint, there are several factors that may account for the decrease in hazardous waste generation, according to the Kentucky Division of Waste Management. First, hazardous waste generation has declined overall nationwide. Next, the U.S. Environmental Protection Agency (EPA) continues to adopt new policies on hazardous waste management and changes to its regulatory requirements. For example, some wastes from remediation projects that once required special treatment or disposal can now be disposed of in solid waste landfills provided that the hazards present are sufficiently below risk assessment thresholds. Finally, some facilities that typically top the list of hazardous waste generators saw marked declines in generation between 1995 and 1998. These include hazardous waste facilities operated by Safety-Kleen and Ken-Dec.

Hazardous wastes are also produced by small businesses such as dry cleaners, auto repair shops, exterminators and photo processing centers. Currently, 534 small quantity generators are registered in Kentucky. A small quantity generator can produce up to 13.2 tons of hazardous waste per year. Generation data for small quantity generators cannot be accessed at this time. However, they likely make up less than 1 percent of the hazardous waste generated in the state.

Hazardous wastes are also generated in the home (mineral spirits, pesticides and house paint). These wastes are exempt from federal or state hazardous waste programs. Some communities in Kentucky, in cooperation with local businesses and industries, have established collection centers or pickup services for the management of household hazardous waste. For example, a regional household hazardous waste collection day held Oct. 2000 in Fayette, Bourbon, Madison and Scott counties netted 11,000 gallons of paint, 11,400 pounds of pesticides, 542 lead acid batteries and 1,060 gallons of oil. Lexington Fayette County Urban County officials estimate 6,125 households participated in the program. Jefferson County established a household hazardous waste collection center in 1996. In the year 2000, 148,095 pounds of household hazardous waste was collected at the center for recycling, reuse and disposal.

Measures - notes and sources

***Measure 1**. 1998 data most recent available. Based on the generation of hazardous waste reported by large quantity generators. Excludes generation of hazardous wastewaters which are no longer reported. Earlier data not available. *1994 and 1995 data differ from previous reports due to RCRIS or industry reporting errors which have been corrected on this chart. Source: RCRIS and BRS database.*

***Measure 2**. *Ashland Petroleum Co. name change to Cattlesburg Refining. Source: RCRIS and BRS Database.*

Measure 2. Top 10 Generators of Hazardous Waste (1998)

Company	City	1995 tons	1998 tons
Safety Kleen	Smithfield	83,575	44,433
Gallatin Steel	Warsaw	7,632	21,793
Rohm & Haas	Louisville	13,195	15,494
LWD, Inc.	Calvert City	11,598	12,019
Cattletsburg Refining*	Catlettsburg	408	10,110
ISP Chemicals	Calvert City	6,585	7,754
Newport Steel	Wilder	4,665	3,685
DuPont Dow	Louisville	3,345	3,651
Ky. Electric Steel	Ashland	3,995	3,499
National Southwire Aluminum	Hawesville	5,901	3,208
total top 10		**140,899**	**125,646**
total state		**433,880**	**182,262**

WASTE MANAGEMENT

HAZARDOUS WASTE IMPORTS AND EXPORTS

Indicator 9. Hazardous Waste Imports and Exports

Background Kentucky, like most states, relies on facilities both inside and outside its borders for recycling, treatment or disposal of hazardous wastes. The amount of waste imported into and exported from Kentucky can vary significantly from year to year.

During 1998, hazardous waste generated in Kentucky was shipped to several states for treatment and disposal. That year, hazardous waste was also imported into Kentucky from 33 states (including Puerto Rico) and from at least one foreign country for treatment and disposal.

Goal Ensure the adequate treatment and disposal of hazardous waste consistent with state and federal rules.

Progress Kentucky remains a net exporter of hazardous waste. The state exported 111,827 tons of hazardous waste out of state for recycling, treatment or disposal in 1998 (the most recent year data is available). This represents 61 percent of the 182,262 tons of hazardous waste reported produced in the state. During 1998, 55,000 tons of hazardous waste was imported into the state for treatment. Both waste exports and imports declined significantly in 1998—41 percent and 42 percent respectively.

Most of the hazardous waste Kentucky receives from out of state is delivered to two large commercial facilities for incineration (LWD Inc.) or fuel blending (Safety-Kleen Envirosystems). Each of these facilities occupies a regional niche in the commercial capacity arena. For the most part, they receive hazardous wastes from states that lack this type of commercial capacity. Shipping costs are often significant and generators search for commercial facilities that are economical to use as well as reliable.

Except for fuel blending and incineration, Kentucky lacks commercial treatment capacity for hazardous waste and there is no commercial disposal capacity within the state. Thus, a significant portion of the state's wastes are shipped to states where regional commercial treatment or disposal facilities exist.

At a Glance

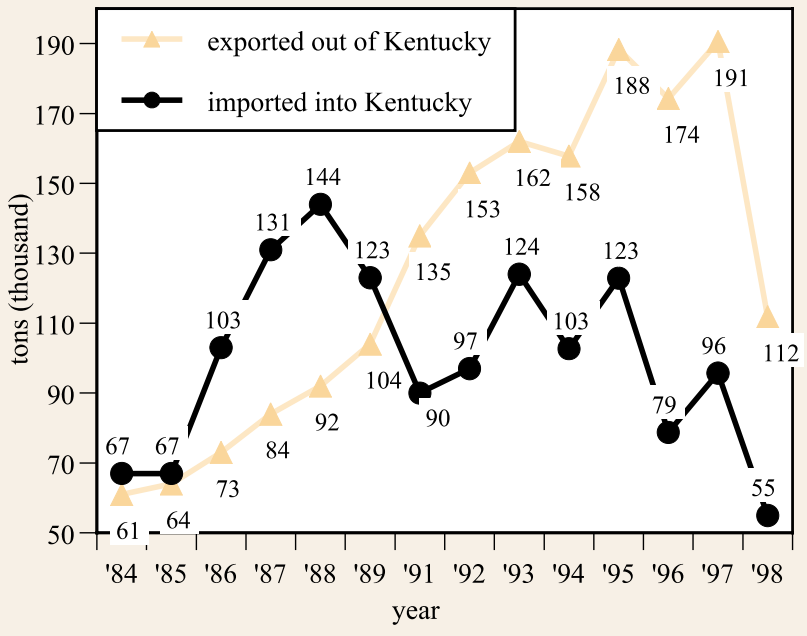
Hazardous waste exported out of Kentucky
1995 . . . . .188,344 tons
1998 . . . . . .111,827 tons

Hazardous waste imported into Kentucky
1995 . . . . .122,863 tons
1998. . . . . 55,000 tons

Measures - notes and sources

Measure 1. *Source: Ky. Division of Waste Management.*

Measure 1. Hazardous Waste Imports and Exports in Kentucky



Hazardous Waste Enforcement

Indicator 10. Hazardous Waste Enforcement and Compliance

At a Glance

Number of hazardous waste facilities (2000)
large generators. . 353
tsd facilities 31
transporters 283
small generators . .502
exempt generators 1,719
recyclers 283
burners/blenders. . 32

Haz. waste inspections
1995 1,783
1999 772

Haz. waste violations
1995 217
1999. 141

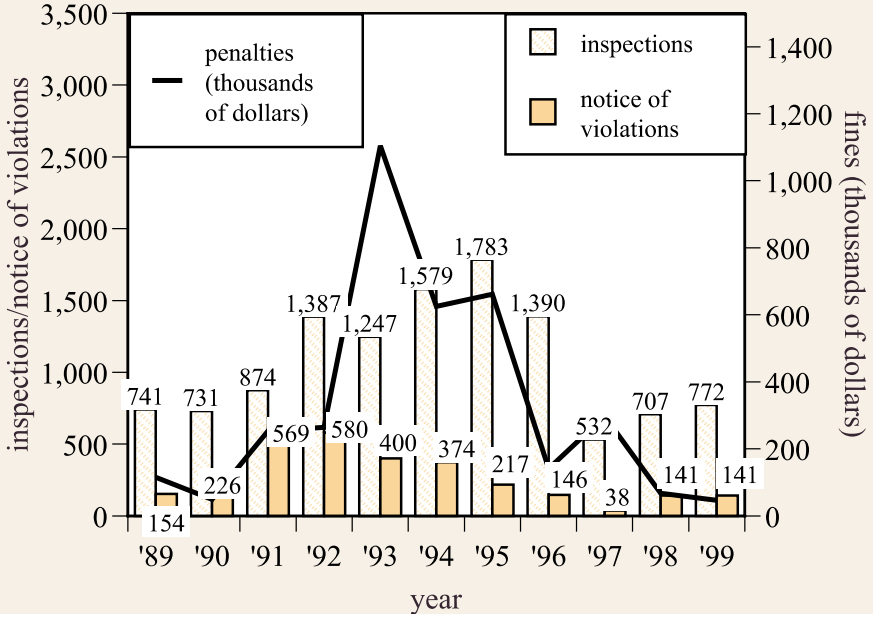
Background Kentucky began regulating hazardous waste in 1979. State hazardous waste permitting and enforcement programs were put in place in 1982. State hazardous waste regulatory programs have evolved since then and now include monitoring, record keeping, emergency planning, closure procedures, identification and the cleanup of waste sites. A number of sources are subject to hazardous waste laws and regulations in Kentucky; they currently include 353 large quantity hazardous waste generators; 31 permitted treatment, storage, and disposal (TSD) facilities; 283 transporters; 502 small quantity generators; 1,719 conditionally exempt small quantity generators; 283 recyclers and 32 burners/blenders. In addition, the state continues to respond to non-notifiers (facilities that fail to report hazardous waste generation) and illegal disposal of hazardous waste.

Goal Ensure that hazardous waste generators and handlers are brought into compliance with state laws and regulations within the shortest possible time after the detection of any violation.

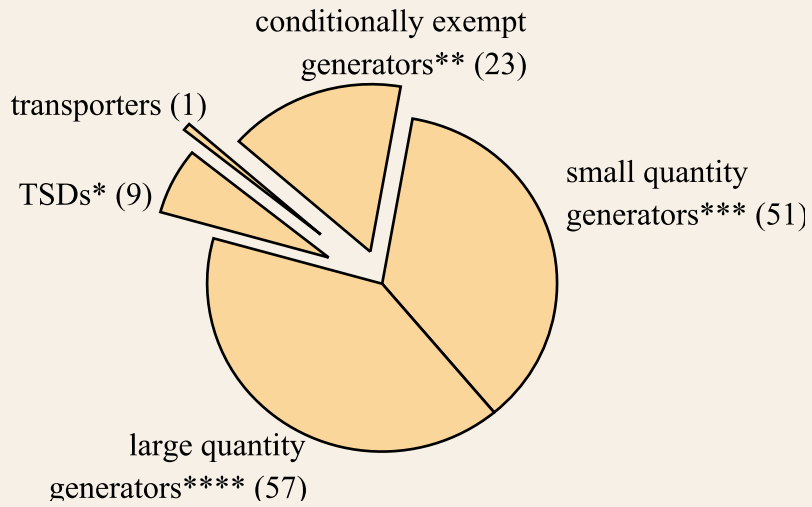
Progress The Kentucky Division of Waste Management is the principal regulatory agency in the state responsible for ensuring that hazardous wastes are properly managed and disposed. In 1995, the number of inspections conducted by the division reached a record high of 1,783 but then fell to a record low of 532 in 1997. The Division of Waste Management attributed the decline in hazardous waste inspections and violations to a shift in enforcement priorities to underground storage tanks and open dumps. However, the state stepped up its hazardous waste enforcement activities in 1999. The number of hazardous waste inspections conducted in 1999 was 772–a 44 percent increase since 1997 when levels were at record lows.

The number of violations cited also increased in 1999 to nearly four times the number cited in 1997. During 1999, the Kentucky Division of Waste Management issued 141 violations and assessed $141,000 in penalties. Forty percent of the violations cited in 1999 were against large quantity generators, followed by small quantity generators (36 percent), and conditionally exempt generators (16 percent).

Measure 1. Hazardous Waste Enforcement Actions



Measure 1. Hazardous Waste Violations by Source and Number in Kentucky (1999)



Measures - notes and sources

***Measure 1**. Chart uses revised and updated data from NREPC computer system which may vary from previous EQC reports. Source: Ky. Division of Waste Management.*

***Measure 2.** *Permitted treatment, storage and disposal facilities that receive waste from off-site. **A generator who accumulates no more than 100 kilograms of hazardous waste in a calendar month or a generator who generates acutely hazardous waste listed in Sections 2, 3, and 4(5) of 401 KAR 31:040 in a calendar month in quantities no greater than 1 kilogram. All quantities of that acutely hazardous waste are subject to administrative regulation under 401 KAR Chapters 32 & 39 and the notification and permitting requirements of KRS 224.01-400, 224.40-310, 224.46-510, 224.46-580, and 224.50-130 to 224.50-413. ***A generator who produces more than 100 kilograms but less than 1000 kilograms of hazardous waste in a calendar month. ****A generator who generates more than 1,000 kilograms per month of hazardous waste or more than 1 kilogram per calendar month of acutely hazardous waste. Source: Ky. Division of Waste Management.*

Contaminated Waste Sites

Indicator 11. Contaminated Waste Sites

At a Glance

Hazardous waste sites
investigated 1,483
contaminated. . . . 1,389
remediated 997

Federal Superfund
sites in Kentucky
number 20
remediated 17

Background In Kentucky, hundreds of old or abandoned waste sites pose threats to the environment and public health. Sites that are highly contaminated, or pose an immediate public health threat, may be proposed for inclusion on the U.S. Environmental Protection Agency (EPA) "National Priority List" (NPL), better known as Superfund. Contaminated sites that do not qualify for federal Superfund status become the state's responsibility. Past hazardous waste management practices have led to numerous contaminated waste sites across the state. Some common sites include abandoned warehouses, manufacturing facilities, processing plants and landfills.

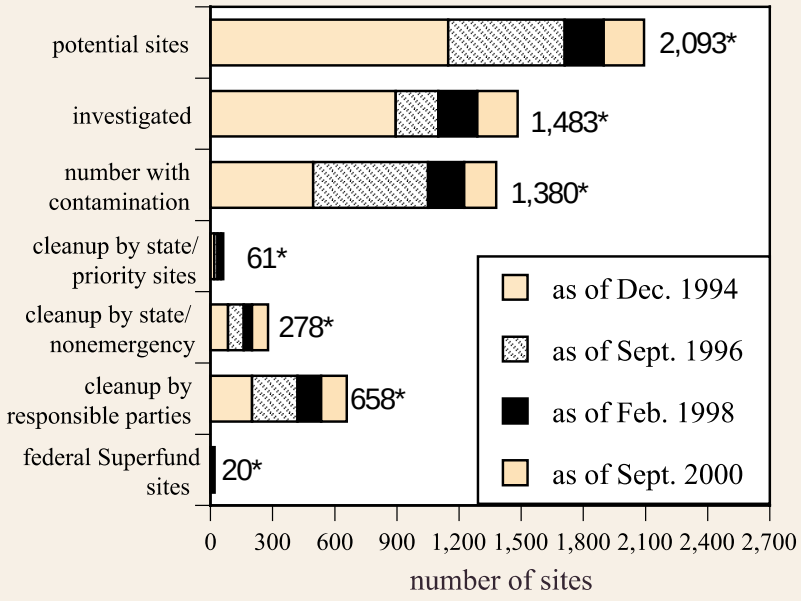
Goal Eliminate the health and environmental threats posed by contaminated waste sites.

Progress To date, more than 2,000 potentially contaminated waste sites have been identified in Kentucky. Of the 1,483 hazardous waste sites investigated, 1,389 had confirmed contamination, and 77 percent have been remediated by the state or responsible parties.

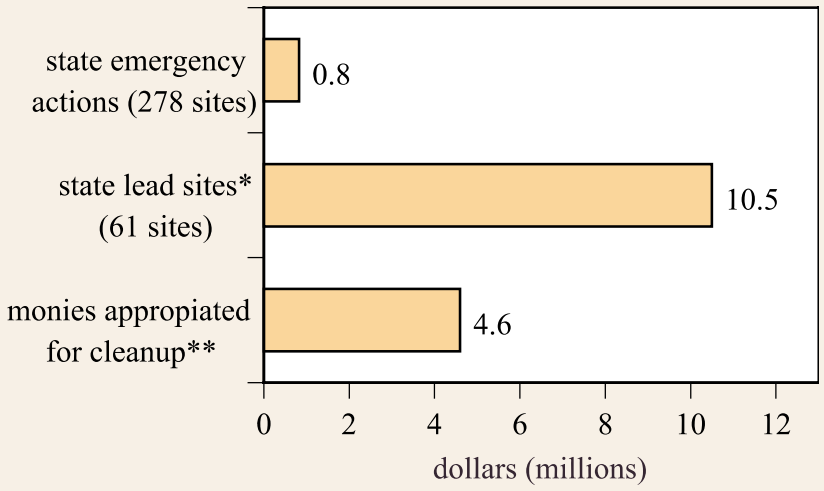
A primary source of funds to clean up contaminated waste sites where responsible parties cannot be found or are financially unable to cleanup a site is the Kentucky Hazardous Waste Management Fund. The fund, established in 1981 and later amended in 1990, is financed through a fee on hazardous waste generated. Each year, about $2.1 million is collected from hazardous waste generators to finance site cleanups. To date, the fund has financed the investigation and remediation of 61 contaminated priority waste sites. In addition, 278 emergency and non-emergency removal operations have been conducted. More than $10 million has been spent from the fund to remediate contaminated sites. The Hazardous Waste Management Fund was scheduled to expire June 30, 2000 but was extended another two years during the 2000 legislative session. At this time, the state has 15 active state priority waste sites that are under remediation using fund monies.

Kentucky has also seen some progress in the remediation of its federal Superfund sites. Seventeen of the 20 federal Superfund sites in Kentucky have had remediation completed or

Measure 1. Contaminated Waste Sites in Kentucky



Measure 2. Expenditures from the Kentucky Hazardous Waste Management Fund



Measure 3. State Priority Waste Sites (1999-2000)

Site	County	Date discovered	Status
Tindall Property	Anderson	1985	RI
Cornish Property	Anderson	1999	RA
Johnson Fork Dump	Boyd	1987	CP
Douglas Lane	Boyle	1996	RI
Mudd Property	Bullitt	1992	RI
Ecology Systems	Calloway	1984	RI
Tobacco State	Fayette	1988	RI
Great South. Refinery	Fayette	1997	RI
Jeff Meade Landfill	Greenup	1979	RD
Billy Glover Dump	Jessamine	1985	RA
Ponderosa Speedway	Lincoln	1997	RI
Allen Chemical	Marion	1976	RI
Derby Tank & Car	Meade	1979	RI
Briar Hill Dump	Scott	2000	RI
Rad Chemical	Warren	1980	RD

Contaminated Waste Sites

Measure 4. Status of Federal Superfund Sites in Kentucky

Site	Listed	Status
A.L. Taylor-Valley of Drums Brooks–Bullitt Co.	1981	cleanup complete-O&M
B.F. Goodrich/Airco (2 sites) Calvert City–Marshall Co.	1982	cleanup complete-O&M
Distler Brickyard West Point–Hardin Co.	1982	cleanup complete-O&M
Distler Farm Louisville–Jefferson Co.	1982	cleanup complete-O&M
Lee's Lane Landfill Louisville–Jefferson Co.	1982	cleanup complete-O&M
Newport Dump Wilder–Campbell Co.	1982	cleanup complete-O&M
Smith's Farm Brooks–Bullitt Co.	1984	cleanup complete-O&M
Maxey Flats Hillsboro–Fleming Co.	1986	cleanup underway
Howe Valley Howe Valley–Hardin Co.	1987	cleanup complete
Red–Penn Sanitation Co. Peewee Valley–Oldham Co.	1989	cleanup complete-O&M
Tri–City Indstrl. Disp. Site Brooks–Bullitt Co.	1989	cleanup complete-O&M
Brantley Landfill Island–McLean Co.	1990	cleanup complete-O&M
Caldwell Lace & Leather Auburn–Logan Co.	1990	no action required
Fort Hartford Coal Olaton–Ohio Co.	1990	cleanup complete-O&M
General Tire & Rubber Mayfield–Graves Co.	1990	no action required
Green River Disposal Site Maceo–Daviess Co.	1990	cleanup complete-O&M
Paducah Gaseous Diff. Plant Paducah-McCracken Co.	1992	site study
National Southwire Alum. Hawesville-Hancock Co.	1992	cleanup remedy selected
National Elec. Coil Dayhoit-Harlan Co.	1992	cleanup

required no further action.

The most costly cleanup of a contaminated waste site in Kentucky is currently underway. The operation of the Paducah Gaseous Diffusion Plant (PGDP) has produced a number of contaminated areas, both at the site and beyond its boundaries. The U.S. Department of Energy (DOE) began operations at the plant in 1952 to make enriched uranium for use in nuclear weapons and later for commercial nuclear fuel. While making an estimated 200,000 tons of nuclear fuel, the plant also generated significant amounts of radioactive waste which has polluted the land and groundwater with radioactive and other contaminants. PGDP is on the U.S. Environmental Protection Agency's National Priorities List. A 2010 deadline has been set by the state for DOE to clean up the Paducah Gaseous Diffusion Plant. Since August 2000, DOE has removed Drum Mountain, an 8,000-ton pile of crushed and contaminated barrels. Work will begin later this year to remove more than 50,000 tons of scrap metal stored at plant. Technology has also been installed to remove trichloroethylene from soil and three new technologies are under consideration to remove contaminants from the groundwater. The Department of Energy has spent $111,226,000 from 1988 to 1999 in its clean up efforts. In fiscal year 2000, DOE spent $16,139,000 on clean up activities. The DOE has estimated it will cost $1.3 billion to eliminate all the contamination. However, the state estimates that cleanup costs will range from $2 billion to $4 billion.

The redevelopment of old contaminated sites was the focus of a bill passed during the 2001 Kentucky legislative session was the "Voluntary Environmental Remediation Act," better known as the brownfields bill. Brownfields are abandoned, idle, or under-used industrial or commercial facilities where redevelopment is complicated by environmental contamination. Many sites that were once used for industrial purposes have been abandoned, and potential developers are reluctant to use these sites because of the liability they pose for any contamination that may be present on the site. Developers are more attracted to sites in pristine, undeveloped areas to avoid liability issues. Development of these undeveloped sites, termed "greenfields," contributes to urban sprawl and unplanned urban expansion. The legislation builds on existing law to define the process to identify and manage or remove contaminants at brownfield sites. Provisions of the bill also address owner liability issues associated with brownfield redevelopment.

Measures - notes and sources

***Measure 1**. *Cumulative total 1994 through 2000. Data revised by the Division of Waste Management from previous EQC reports. Source: Ky. Division of Waste Management*

***Measure 2**. Cumulative total as of September 2000.*

**Total funds used for remediation. ***Funds appropriated for remediation (cleanup underway) Source: Ky. Division of Waste Management.*

***Measure 3**. RD - Remedial design (cleanup plan under development). RA - Remedial assessment (site under study). RI-Remedial investigation (site under investigation). CP - cleanup in progress. Source: Ky. Division of Waste Management*

***Measure 4**. O&M - Remediation complete and in operation and maintenance phase. Source: Ky. Division of Waste Management.*

Underground Storage Tanks

Indicator 12. Underground Storage Tanks

At a Glance

Number of underground storage tanks
active tanks. . . 13,000
closed tanks . . 31,700

Underground storage tanks with:
contamination . .11,452
remediated 8,666
long-term cleanup. 392

UST inspections
1995. 5,614
1999 2,481

UST violations
1995 1,241
1999 112

Background Underground petroleum and hazardous chemical storage tanks began to be regulated in Kentucky in 1986. These tanks can leak and pose pollution threats to drinking water supplies and to the environment

There are 46,407 underground storage tanks (USTs) currently registered in Kentucky. As of February 2001, an estimated 13,068 tanks are in active use, 1,584 are in temporary closure (have not fully met closure and cleanup requirements), and 31,755 have been permanently closed in accordance with state regulations. It is estimated that there are thousands of tanks in Kentucky at abandoned gas stations and other locations that have not been registered.

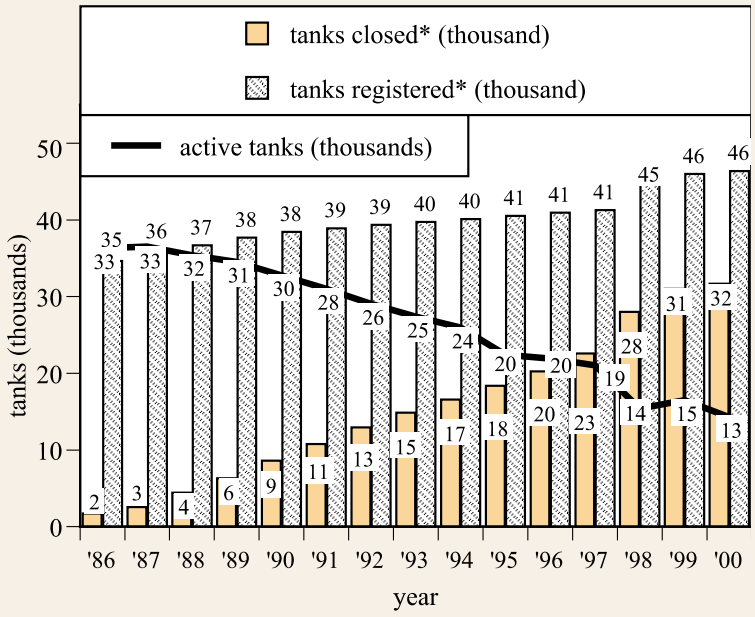
Goal Oversee the permanent closure, investigation and remediation of UST sites and ensure compliance for all active underground storage tanks for leak detection, spill prevention, overfill prevention and corrosion protection requirements.

Progress As of January 2001, 90 percent of the 13,068 active registered USTs met release detection rules and 98 percent met the overfill, corrosion protection and spill prevention requirements as specified in federal and state laws. This is a significant improvement since November 1998, when 45 percent of the active tanks did not meet the tank rules. All tanks in Kentucky that failed to meet the tank upgrade rules as required by Dec. 22, 1998 were assessed penalties, resulting in the highest penalty collection levels (in 1999) since EQC began tracking UST enforcement actions.

As of January 2001, 11,452 UST facilities had performed investigation and corrective action activities. Of these, 8,666 UST sites have been remediated. Most UST sites simply require the removal of soil to address contamination problems. However, some UST sites require additional remediation actions to address groundwater contamination. Currently, 392 UST sites are in long-term corrective action. These sites require actions such as the pump and treatment of groundwater or bioremedation to address contamination problems.

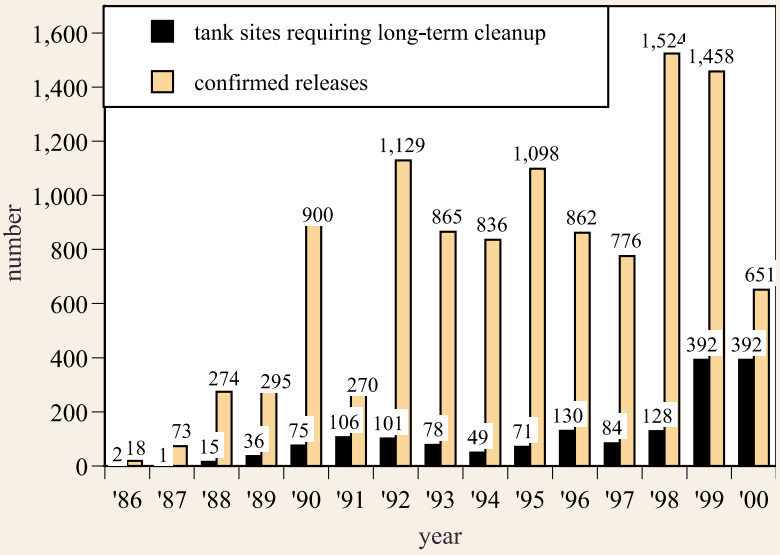
In 1990, Kentucky established the Petroleum Storage Tank Assurance Fund. The fund was created to help UST owners and operators comply with federally mandated financial responsibility requirements and to reimburse owners and operators for eligible costs of corrective actions related to leaking USTs. The fund's revenues are generated primarily through a fee of 1.4 cents per gallon of motor fuel sold in the state. As of December 2000, the fund has obligated $276.4 million for site investigations, tank removals and remedial activities at 4,082 UST facilities. The fund has processed 19,256 payment claims resulting in the reimbursements of $213.7 million to UST owners and operators. Currently, 460 applications for financial assistance amounting to $31.4 million are pending approval. The average cost of a UST cleanup has been $63,108 per site. There are 2,747 UST project fund cleanups currently underway.

Measure 1. Underground Storage Tanks in Kentucky

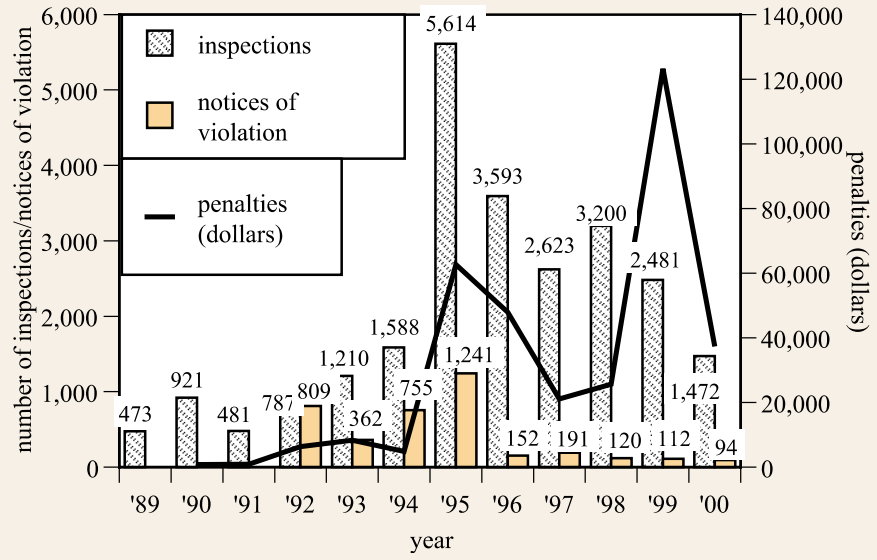


UNDERGROUND STORAGE TANKS

Measure 2. Underground Storage Tank Contamination Incidents in Kentucky



Measure 2. Underground Storage Tank Enforcement Actions in Kentucky



Measures - notes and sources

***Measure 1**. *Cumulative total to date for tanks closed and registered. Source: Ky. Division of Waste Management.*

***Measure 2**. Sites with groundwater and/or soil contamination. Confirmed releases are defined as either laboratory or field evidence of contamination. Source: Ky. Division of Waste Management.*

***Measure 3**. Penalty dollars represent the amount collected per year. Source: Ky. Division of Waste Management.*

Chapter 5

Toxic Pollutants

TOXIC POLLUTANTS

GENERATION OF TOXIC CHEMICALS

Indicator 1. Generation of Toxic Chemicals

Background Toxic pollutants are those pollutants that can cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse ecological and environmental effects.[1] Toxic wastes are often produced as by-products of the manufacturing process. The U.S. Environmental Protection Agency (EPA) developed the Toxic Release Inventory (TRI) in 1986 to estimate and track the generation and the release of more than 650 toxic chemicals. The TRI requires certain manufacturers to self-report to the public the amount of chemicals generated, released or transferred for treatment. But TRI has its limitations. The U.S. Office of Technology Assessment estimates that the TRI accounts for only 5 percent of the total releases of toxic chemicals to the environment.[2] In addition, chemicals and industries are continually added to or deleted from the TRI reportable list, making yearly comparisons difficult. Still, TRI is the best data available to monitor toxic generation and releases. In 1999, the most recent year that TRI data were available, 22,639 facilities in the United States reported generating 29 billion pounds of toxic chemicals and related waste.[3]

Goal Reduce the weight of toxic chemicals generated by 25 percent at each Kentucky facility by January 1, 1997, and by 50 percent by January 1, 2002, using 1987 as a base year (per KRS 224.46-305).

Progress Kentucky industries continue to generate a significant amount of toxic chemicals. In 1999, 456 facilities generated 714.8 million pounds of TRI chemicals in Kentucky.[4] The amount of toxics generated continues to increase as more industries and chemicals are added to the reportable list. For example, in 1998, the U.S. EPA required seven additional industrial sectors to report. These sectors included metal and coal mining, electrical utilities, hazardous waste facilities, chemical wholesalers, petroleum terminals and solvent recovery services. In Kentucky, these seven industries added an estimated 123.3 million pounds of production-related toxic chemicals to the 591.5 million pounds reported by the original facilities during 1999.

Electric utilities, a newly reporting industrial sector in 1998, became the second-largest single source of toxics, generating 96.2 million pounds of toxics (13 percent of the total) during 1999. However, the chemical industry produced by far the most toxic waste (355.6 million pounds or 50 percent of the total generated). No analysis has been made by the state to determine its progress toward meeting the 25 percent and 50 percent toxic reduction goals.

At a Glance

Companies generating toxic chemicals (1999)
U.S. 22,639
Kentucky 456

Generation of toxic chemicals in Kentucky
1991. . .525.8 million lbs.
1998. . .646.1 million lbs.
1999. . 714.8 million lbs.

Generation of toxic chemicals by source
chemical industry. . 50%
electric utilities. . . 13%
primary metals 12%
paper 6%
printing 4%
other 15%

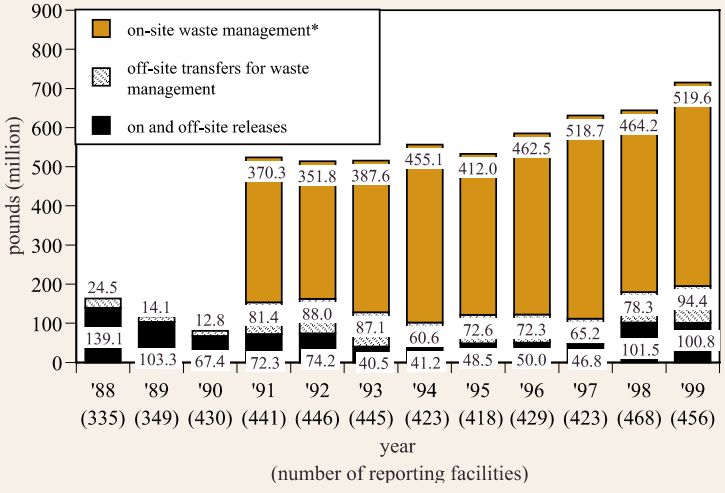
Footnotes

1. National Air Toxics Program: The Integrated Urban Strategy Report to Congress, U.S. EPA, July 2000.
2. 1994 Toxic Release Inventory Report, page 214, U.S. EPA, 1996.
3. Toxic Release Inventory 1999 Executive Summary, page E-6, U.S. EPA, 2001.
4. 1998 Toxics Release Inventory State Fact Sheets, U.S. EPA, 2000.

Measures - notes and sources

***Measure 1**. Previous years not adjusted for newly added or deleted chemicals. In 1999 TRI release and transfer totals adjusted due to the misreporting of 5,423,876 lbs. of lead compounds as being released when it was transferred offsite for recycling. *Onsite waste management reported after 1991. Source: Toxics Release Inventory Explorer.*

Measure 1. Generation of Toxic Chemicals in Kentucky



Toxic Chemical Releases

At a Glance

Toxic releases to the environment
1990. . . 67.4 million lbs.
1997. . . 46.8 million lbs.
1999. . .100.8 million lbs.

Toxic releases by media (million pounds) (1999)
air. 75.315
land 15.515
disposal off site . .6.913
water. 3.014
RCRA landfill 0.021

Indicator 2. Toxic Chemical Releases

Background Most of the toxic chemicals generated by Kentucky industries are managed at the site produced through recycling, energy recovery or treatment. However, some of these pollutants are released to the environment. During 1999, 14 percent (100.78 million pounds) of the 714.8 million pounds of toxic chemicals generated were released to the land, air or water.[1] Kentucky is ranked 20th in the nation in toxic releases.[2] A majority of the toxic releases (65 percent) occurred in 10 counties.[3]

Goal Reduce the weight of toxic chemicals generated by 25 percent at each Kentucky facility by January 1, 1997, and by 50 percent by January 1, 2002, using 1987 as a base year.

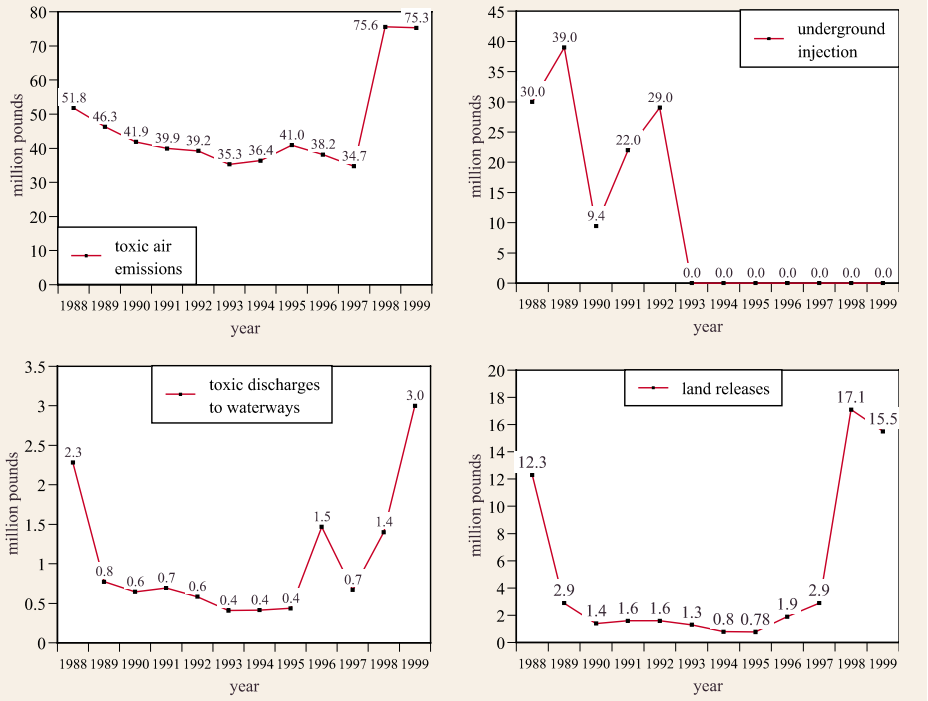
Progress In 1999, 366 Kentucky industries reported releasing 100.8 million pounds of toxic chemicals to the environment. Ten of these companies accounted for 51 percent, or 51.3 million pounds, of the toxic chemicals releases.

Between 1995 and 1999, the pounds of toxic chemical releases increased 108 percent. This was due to the addition of 286 chemicals in 1994 and the addition of 7 industrial sectors to the reporting list in 1998. A review of the original industries (excluding the 7 new reporting sectors) reveals a yearly decline (from 12 percent to 1 percent) in toxic releases since 1996. Toxic chemical releases from the original industries releases fell from 49.9 million pounds in 1996 to 40.39 million pounds in 1999—a 19 percent decline. The seven new reporting industries released 60.39 million pounds of toxics to the environment in 1999.

A majority of the toxics released to the environment during 1999, 75 percent (75.3 million pounds), were released to the air. Between 1997 and 1999, air releases increased by 117 percent, land releases increased 434 percent, while toxic chemical releases to waterways increased fourfold. These increases were due to the addition of seven new reporting industries.

Hydrochloric acid and sulfuric acid were the top toxic chemicals released to the environment in Kentucky during 1999. Some 44.2 million pounds of these chemicals were released to the air in 1999 (44 percent of the total toxic releases). The electric power industry was responsible for 97 percent of the hydrochloric and sulfuric acid releases in the state. Power plants were also responsible for about half of the metals (lead, chromium, mercury, nickel, aluminium, antimony, barium, beryllium, cobalt, copper, manganese, zinc and their compounds) reported released in the state in 1999.

Measure 1. Releases of Toxic Chemicals to the Environment in Kentucky



Footnotes

1. 1999 Toxics Release Inventory State Fact Sheets, U.S. EPA.

2. Toxic Release Inventory 1999 Executive Summary, page E-4, U.S. EPA, 2001.

3. TRI Explorer, Web site - http://www.epa.gov/triexplorer/geography.htm.

TOXIC POLLUTANTS

TOXIC CHEMICAL RELEASES

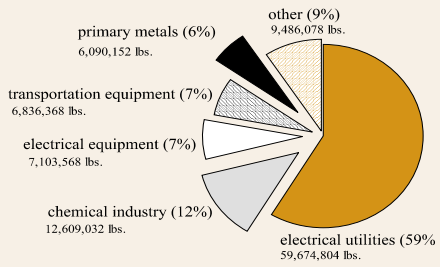
Measure 2. Top Ten Toxic Chemicals On-Site Releases to Land, Water, Air (1999)

***Land Releases (lbs.)**
Barium Compounds (5,256,883)
Zinc Compounds (2,422,355)
Manganese Compounds (1,490,880)
Nitrate Compounds (1,069,179)
Nickel Compounds (934,216)
Copper Compounds (767,854)
Chromium Compounds (739,379)
Lead Compounds (685,633)
Aluminum (540,000)
Arsenic Compounds (451,525)

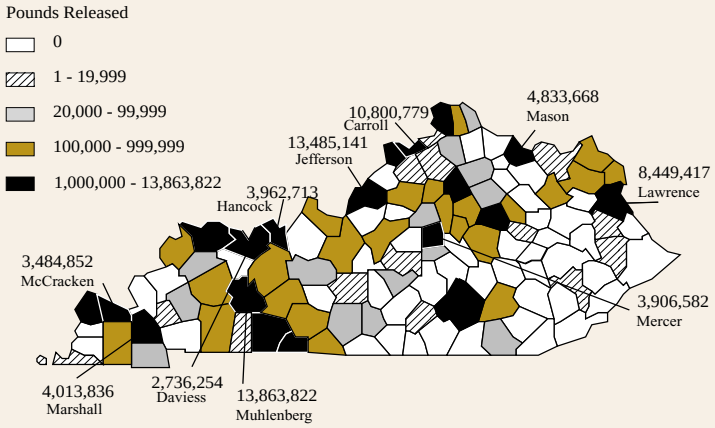
Water Releases (lbs.)
Nitrate Compounds (2,335,564)
Manganese Compounds (202,922)
Barium Compounds (161,260)
Zinc Compounds (59,825)
Ammonia (44,249)
Arsenic Compounds (30,546)
Nickel Compounds (26,044)
Methanol (19,397)
Copper compounds (18,271)
Antimony Compounds (17,461)

Air Releases (lbs.)
Hydrochloric Acid (26,899,704)
Sulfuric Acid (17,170,432)
Methanol (4,096,597)
Toluene (3,384,126)
Xylene (2,647,511)
Chlorodifluoromethane (2,384,043)
Hydrogen Fluoride (2,149,608)
N-Hexane (2,099,393)
Dichloromethane (1,876,40)
Ammonia (1,651,485)

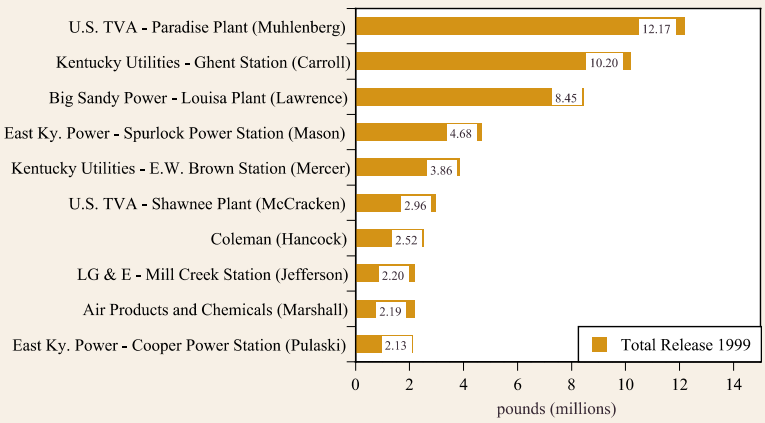
Measure 3. Toxic Chemical Releases in Kentucky by Source (1999)



Measure 4. Toxic Chemical Releases to Air, Land, Water and Top Ten Counties with Releases (1999)



Measure 5. Top 10 Kentucky Facilities (County) Releasing Toxic Chemicals to the Environment (1999)



Measures - notes and sources

***Measure 1**. Previous years are not adjusted for newly added or deleted chemicals. Disposal to land does not include releases to RCRA landfills. Past years numbers have been revised. Source: Toxics Release Inventory Report.*

***Measure 2**. *Includes only onsite releases. Source: Toxics Land Release Inventory Report.*

***Measure 3**. Releases reported at site of generation. Source: Toxics Release Inventory Report.*

***Measure 4**. Onsite releases. Source: Toxics Release Inventory Report.*

***Measure 5.** 1999 numbers include both land releases and transfers offsite for land disposal. Source: Toxics Release Inventory Reports.*

Toxic Chemical Transfers

Indicator 3. Toxic Chemical Transfers

At a Glance

Toxic chemicals transferred offsite
1991. . . 83.2 million lbs.
1997. . . 67.6 million lbs.
1999. . . 94.4 million lbs.

Principal methods of disposal (million pounds)
recycling 55.515
energy recovery 22.434
treatment. 16.455

Background About 73 percent (519.6 million tons) of the 714.7 million pounds of toxic chemicals generated in Kentucky during 1999 were treated at the site of production, while 14 percent (100.8 million pounds) were released to the environment. The remaining 13 percent (94.4 million pounds) were transferred offsite for treatment or disposal. Chemicals can be transferred offsite for recycling; energy recovery; treatment (includes neutralization, incineration, biological and physical separation); to a publicly owned wastewater treatment plant for treatment; or to a landfill for disposal.

Goal To promote a hierarchy of waste management priorities with source reduction the preferred option as specified in the federal Pollution Prevention Act of 1990. If a waste cannot be eliminated outright, then the second-best waste management option is to recycle, followed by treatment and lastly disposal.

Progress Nationwide, during 1999, 3.6 billion pounds of toxics were transferred offsite for disposal. In Kentucky, 263 facilities reported transferring 94.4 million pounds of toxic pollutants off site. Kentucky ranked eighth in the nation in the amount of toxic chemicals transferred offsite.[1] In addition, Kentucky received 13.9 million pounds of toxic waste from other states for treatment.[2]

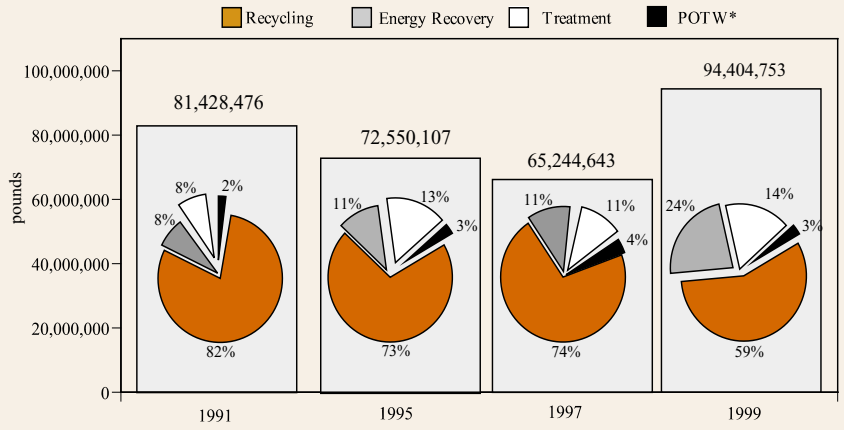
More than half (59 percent or 55 million pounds), of the toxic chemicals transferred offsite by Kentucky facilities were recycled in 1999. Another 24 percent (22.4 million pounds) were recovered for energy, and 17 percent (16.4 million pounds) were treated to render them nontoxic.

The notion of reducing or preventing the generation of toxic pollutants has been promoted in the state by the Kentucky Pollution Prevention Center. The center is based at the University of Louisville. The center provides free assistance to companies to help reduce and prevent waste. To date, the center has trained 6,200 people during 68 seminars and performed 29 site assessments to assist companies reduce and prevent waste.

Footnotes

1. TRI Explorer, Web site - http://www.epa.gov/triexplorer/geography.htm.
2. Toxic Release Inventory 1999 Public Data Report, page 3-20, U.S. EPA, 2001.

Measure 1. Kentucky Generated TRI Chemicals Transferred Off-Site



Measures - notes and sources

Measure 1*. Transfers offsite for recycling, energy recovery, treatment and disposal were not tracked until 1991. U.S. EPA moved transfers offsite for disposal into the release category. 1996 was the first year that land disposal offsite was tracked as a release. **POTW - Publicly-Owned Treatment Works. Source: Toxics Release Inventory Reports.*

TOXIC POLLUTANTS

PRIORITY TOXIC CHEMICALS

Indicator 4. Priority Toxic Chemicals

Background In 1991, the U.S. Environmental Protection Agency (EPA) launched a national program to encourage industries that release and transfer significant amounts of highly toxic chemicals to voluntarily reduce their emissions. A primary focus of the program was also to demonstrate that industries could voluntarily make reductions without the use of traditional regulatory requirements.

The national "33/50 Program" is designed to track the release and transfer of 17 TRI priority chemicals from participating industries using 1988 as the baseline. These chemicals were targeted by the U.S. EPA for reduction because they are highly toxic, used in large volumes, or pose a significant risk to public health and the environment. Nationwide, 6,830 facilities participated in the U.S. EPA's 33/50 Program.[1] Approximately 132 facilities in Kentucky participated in the program.

Goal Reduce the generation of 17 TRI priority chemicals 33 percent by 1992 and 50 percent by 1995, using 1988 as the base year.[2]

Progress The U.S. EPA reports that companies participating in the 33/50 program have met the program reduction goals. Total U.S. generation of 17 TRI priority chemicals was reduced by 67.6 percent between 1988 and 1996. Kentucky facilities participating in the 33/50 program reduced the releases of the 17 priority toxics by 53 percent between 1988 and 1995.[3]

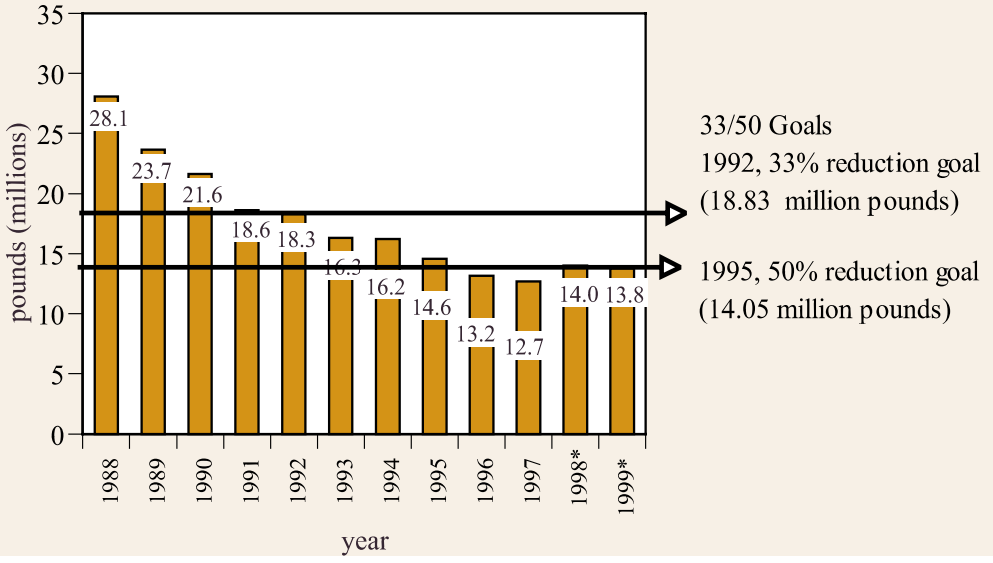
A review of statewide releases of the 17 priority TRI chemicals found that Kentucky met the 50 percent reduction goal in 1996.[4] Data for 1999 reveals that Kentucky continues to meet the 50 percent reduction goal for the 17 TRI chemicals. The national 33/50 program ended in 1996.[5] A new integrated air toxic strategy is now under development by the U.S. EPA.[6] The strategy targets 33 toxic pollutants for reduction that pose the greatest potential health threat in urban areas.

At a Glance

Number of Kentucky facilities participating in the 33/50 toxics reduction program. . 132

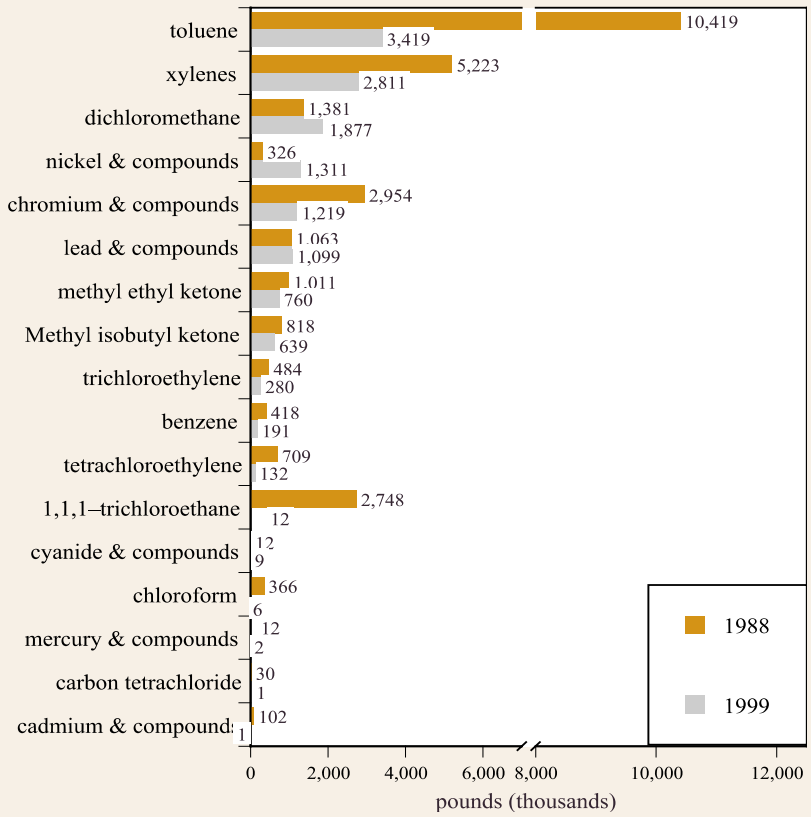
Release of 17 priority chemicals (million lbs.)
1992 . . . . . 18.3
1995 . . . . . 14.6
1998 . . . . . 14.0
1999 . . . . . 13.8

Measure 1. Releases of 17 Priority Toxic Chemicals in Kentucky



PRIORITY TOXICS

Measure 2. Release and Transfer of 17 Priority Toxic Chemicals in Kentucky



Footnotes

1. *33/50 Program, The Final Record, page 7, U.S. EPA, March 1999.*
2. *Ibid, page 1.*
3. *33/50 Program, The Final Record, page 23, U.S. EPA March 1999.*
4. *Ibid.*
5. *Ibid, page 2.*
6. *National Air Toxic Program: The Integrated Urban Strategy Report to Congress, U.S. EPA, July 2000.*

Measures - notes and sources

Measure 1. *Based on releases on and offsite. Does not include transfers for recycling and energy recovery, which were not reported until 1990. Yearly totals are based on the reduction of priority chemicals by all Ky. facilities and not just those participating in the national 33/50 program. Data for previous years includes revised numbers. *Includes 7 new reporting industries. Source: Toxics Release Inventory Reports.*
Measure 2. *This chart includes releases on and offsite. Source: Toxics Release Inventory Reports.*

TOXIC POLLUTANTS

SPILLS & EMERGENCY RESPONSE

Indicator 5. Spills and Emergency Response

Background Each year, millions of gallons of toxic and hazardous substances are accidentally spilled along transportation routes and at industrial sites across the nation. Industries and others handling these materials are required to report spills and accidental releases immediately to state and local officials.

Goal Prevent and respond to and contain spills to minimize environmental degradation and public health threats.

Progress Incident notifications received by the Kentucky Department for Environmental Protection's Environmental Response Team have increased from an average of one report a day in 1983 to 8.4 a day in 2000. The 17-year rise in reported spills is attributed to an increase in transportation activity due to a growing economy, the tightening of reporting requirements earlier in the decade and better education and awareness of reporting requirements. In 2000, there were 3,069 release incidents reported. The drop in reported spills from 1998 to 2000 is due to the phaseout of many older underground petroleum storage tanks. These old tanks were required to be removed or upgraded by Dec. 22, 1999. The Emergency Response Branch estimates that up to 30 percent of the spills that had been reported each year for the past few years were the result of leaking underground storage tanks.[1]

Kentucky experienced a number of major spills in 2000. They included the Ashland Petroleum pipeline break in Clark County which resulted in a spill of 500,000 gallons of crude oil onto a farm and nearby golf course. A fire at the Wild Turkey Distillery released thousands of gallons of bourbon into the Kentucky River, killing an estimated 227,000 fish. This was the largest fish kill in Kentucky history. Kentucky also fell victim to the worst coal slurry spill in the history of the Southeast. On Oct. 11, 2000, 250 million gallons of coal slurry spilled out of a failed impoundment in Martin County. The slurry water mixture clogged 60 miles of waterways. A cleanup of the spill is underway by Martin County Coal, which it estimates may cost $46 million.

At a Glance

Reported spills in Kentucky

1990	2,209
1998	4,534
2000	3,651

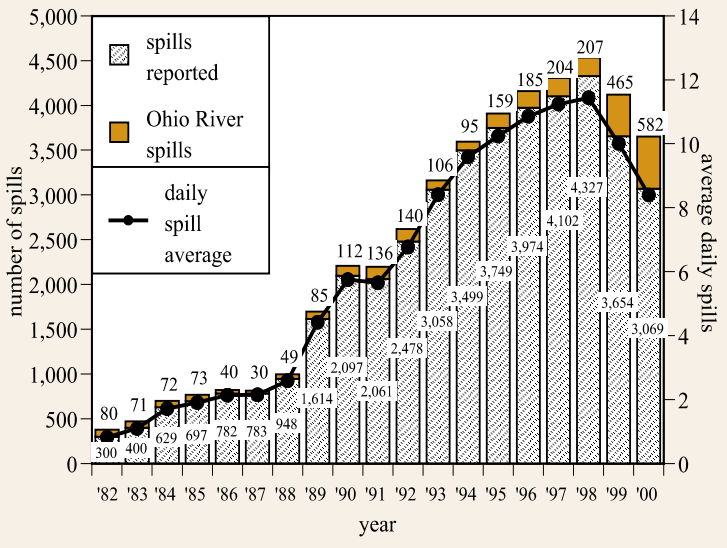
Footnotes

1. Ky. Division of Water, Field Operations Branch, October 2000.

Measures - notes and sources

Measure 1*. 1982-83 data are estimates. 1986 Federal Emergency Planning and Community Right-to Know Act required more extensive spill reporting. Source: Ky. Department for Environmental Protection.*

Measure 1. Toxic and Hazardous Spills in Kentucky



Agricultural & Lawn Care Chemicals

Indicator 6. Agricultural and Lawn Care Chemicals

At a Glance

Agricultural pesticides used in Kentucky
1990 . . . 9.03 million lbs.
1995 . . . 8.49 million lbs.
1999 . . . 9.20 million lbs.

Leading agricultural pesticides used in Kentucky (pounds)
Atrazine 930,908
Gyphosate. . . . 1,319,833
Metolachlor. . . . 900,452
Maleic Hydradize 689,460
Acetochlor 567,794

Collection of old agricultural pesticides
1995 . . . . . 8,700 lbs.
1998 . . . . . .37,460 lbs.
1999. . . . . 50,836 lbs.

Lawn care pesticides used in Kentucky
1992 . . . . . 598,000 lbs.
1997 . . . . . 553,000 lbs.
1999 . . . . . unknown

Background There is increasing concern regarding the health and environmental effects associated with the use of more than 20,000 different pesticide products registered for use in the United States. Agriculture accounts for 75 percent of the total amount of pesticides used in this country.[1] The use of agricultural pesticides and fertilizers has increased crop yields significantly. However, these chemicals can also run off the land, pollute nearby waterways and seep into groundwater.

Nationwide, an estimated 707 million pounds of pesticides were used for agricultural purposes during 1997.[2] In Kentucky, agricultural chemicals are widely used on the 5.2 million acres of land in active crop production. Kentucky farmers used an estimated 9.20 million pounds of pesticides in 1999. The total pounds of pesticides sold in Kentucky have remained relatively constant between 1990 and 1999. Yearly fluctuations in pesticide use are often associated with weather conditions and economic factors.

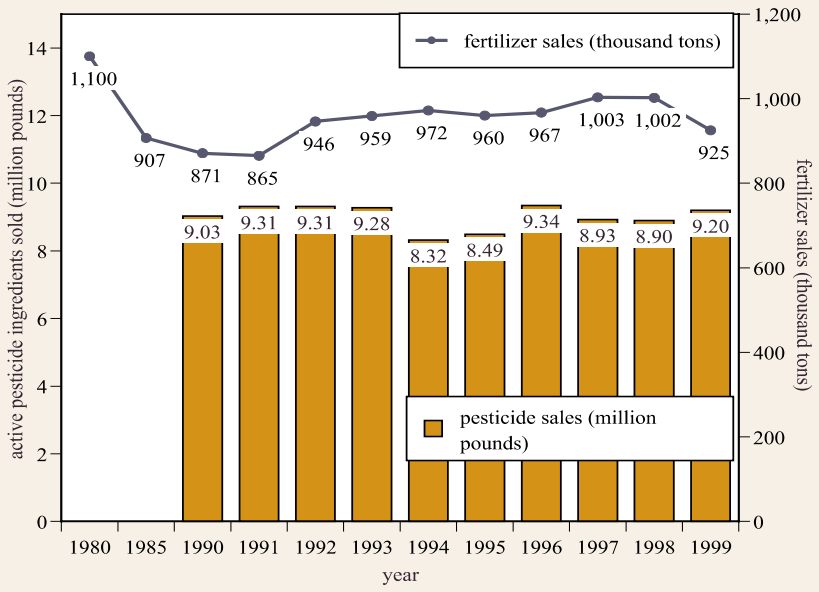
Five pesticides accounted for 51 percent of the sales in Kentucky during 1999. Atrazine remains the top agricultural pesticide sold in Kentucky and accounts for 23 percent of sales, a 3 percent increase from 1998. Atrazine is a herbicide used to control weeds in corn fields. Glyphosate, another broad-spectrum herbicide, is second in sales.

Goal Reduce pesticide use and ensure the safe use and disposal of pesticides.

Progress State efforts to promote the safe use and disposal of pesticides continue. The Kentucky Division of Conservation encourages the use of Integrated Pest Management (IPM)—a program to reduce pesticide use on farmlands. However, it is not known how much of the state's 5.2 million acres of cropland currently utilize IPM.[3]

In 1995, the Kentucky Department of Agriculture initiated a program to collect old or unwanted agricultural pesticides related to farm use. During 1999, a record amount of pesticides was collected (50,836 pounds) from 202 participants and disposed of at the Liquid

Measure 1. Pesticide and Fertilizers Sales in Kentucky



Waste Disposal (LWD) hazardous waste incinerator in Calvert City.[4] The leading pesticides collected were: toxaphene, trifluralin, DDT/DDD/DDE and methoxychlor. To date, the program has collected 222,767 pounds of old pesticides from 727 participants.

The Kentucky Division of Pesticides also operates a rinse-and-return program for pesticide containers. In fiscal year 1999-00, a total of 96,000 pounds of containers were collected. That year, 110 counties participated in the program and 470,912 one-gallon and 329,901 2.5-gallon containers were collected and chipped for recycling—this is a 24 percent statewide recycling rate for pesticide containers.[5]

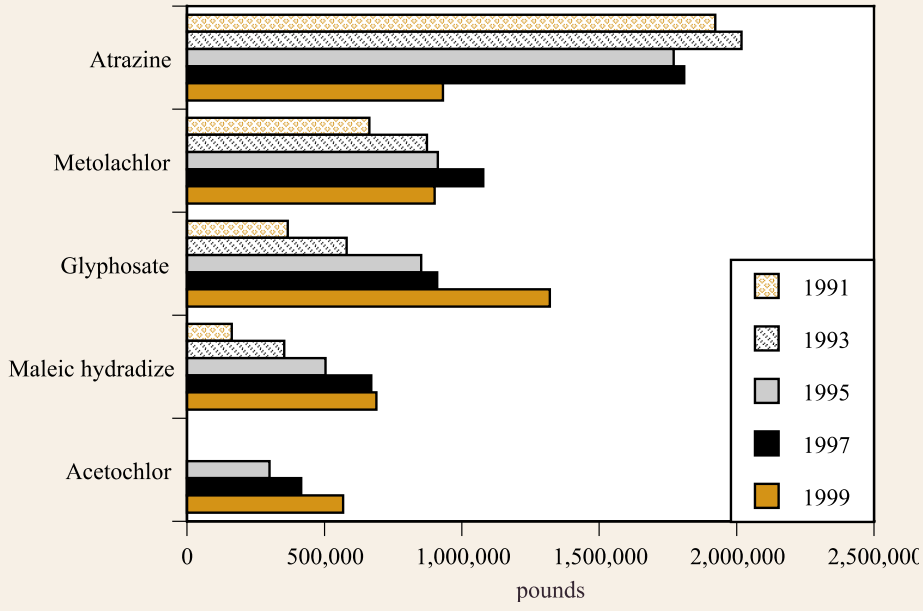
Footnotes

1. *Pesticide Sales and Industry Usage 1996 and 1997 Market Estimates, page 11, U.S. EPA, November 1999.*
2. *Ibid.*
3. *Ky. Department of Agriculture, August 2000.*
4. *Pesticide Collection Program, Ky. Department of Agriculture, Division of Pesticides.*
5. *Ibid.*

Measures - notes and sources

Measure 1. *Pesticide sales based on annual surveys. Pesticide sales data not available prior to 1990. Source: Ky. Department of Agriculture, Ky. Agriculture Statistics Service.*
Measure 2. *Pesticide sales based on annual surveys. Pesticide sales data not available prior to 1990. Source: Ky. Department of Agriculture, Ky. Agriculture Statistics Service.*

Measure 2. Top Sales of Active Pesticide Ingredients In Kentucky



Pesticide Residues in Food

Indicator 7. Pesticide Residues in Food

At a Glance

Pesticide residues in food (percent detects)
U.S. 35%
Kentucky produce . . 0%

Pesticide residues in food (percent detects above tolerance levels)
U.S. 1.9%
Kentucky produce . 0%

Number of organic farms in Kentucky
1998 67
2000. 80

Background

Pesticides are probably one of the most used and regulated chemical products in the United States. Several agencies regulate the use of pesticide. These include the U.S. Environmental Protection Agency (EPA), the Food & Drug Administration and the U.S. Department of Agriculture. There are more than 14 separate regulations governing the use of pesticides. All of these regulations are in place to help protect human health.

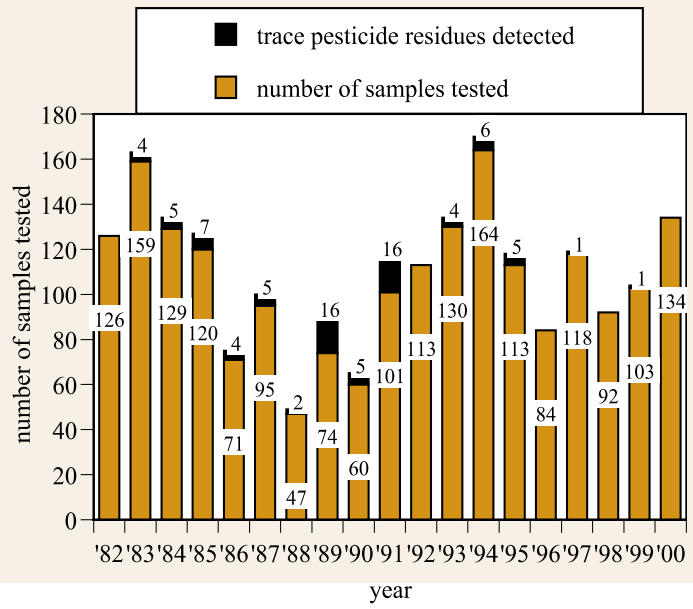
There are currently 20,000 registered pesticide formulations. Of these 20,000 pesticide formulations, the U.S. EPA has set residue (tolerance) limits on 3,551. The U.S. EPA plans to reassess tolerance limits and exemptions for 9,721 pesticide active ingredients by 2006 to meet the new requirements of the Food Quality Protection Act.[2] The act specifically requires the U.S. EPA to carefully evaluate children's exposure to pesticide residues in and on foods they most commonly eat (i.e., apples and apple juice, orange juice, potatoes, tomatoes, soybean oil, sugar, eggs, pork, chicken and beef). The U.S. EPA is also evaluating new and existing pesticides to ensure that they can be used with a reasonable certainty of no harm to adults as well as infants and children.

Goal Reduce the health risks of pesticide residues in food.[3]

Progress Despite many regulations, pesticide residues are still found in our food supply. The U.S. Food and Drug Administration reports that 35 percent of the food tested during 1999 had detectable pesticide residues, of which 1.9 percent of samples were above the allowable limits. The food sampled that violated federal pesticide residue standards most often were: blackberries (detected in 75 percent of tests), kale (detected in 33 percent of tests), okra (detected in 22 percent of tests) and mustard greens (detected in 14 percent of tests).[4]

Chloropyrifos, malathion and diazinon were the pesticides most often detected in food samples tested by the U.S. Food and Drug Administration. These chemicals are now either under review or will be phased out by the U.S. EPA. Diazinon will be phased out for indoor use beginning in March 2001 and for all lawn, garden and turf uses by Dec. 2003. Malathion is currently under public comment and is being reviewed for phaseout. Chloropyrifos, commonly known as Dursban, will be phased out by December 31, 2001.[5] All of these chemicals are organophosphates. Organophosphates are neurotoxic, meaning they can harm the central nervous system.[6] Gerber baby foods has stopped

Measure 1. Pesticide Residues in Kentucky Produce



receiving fruits and other produce grown using organophosphates due to the risks posed to infants and children.[7] The U.S. EPA is reviewing the entire class of organophosphate pesticides.

The Kentucky Cabinet for Health Services randomly samples produce grown in the state for pesticide residues. In 2000, 134 samples were tested and no residual levels of pesticides were found.

Public and commercial interest in foods produced without the use of chemicals is growing. As of December 2000, 80 organic farms (6,090 acres) were certified by the state, compared to 67 in 1998. About 1,470 acres are currently in active organic crop production in Kentucky.[8]

In previous years, the Environmental Quality Commission tracked lawn-care chemicals used by commercial applicators in Kentucky. However, the lawn care chemical survey conducted by the Kentucky Division of Pesticides, was discontinued in 1998. Officials from the division report that the survey was discontinued because of a lack of funding, manpower shortages and problems with the data reporting system. Data concerning the use of lawn and garden chemicals in the United States is not tracked by any federal agency.

Footnotes

1. *Pesticide Sales and Industry Usage 1996 and 1997 Market Estimates, page 11, U.S. EPA, November 1999.*

2. *Tolerance Reassessment, U.S. EPA, Web - site - http://www.epa.gov/pesticides/tolerance.*

3. *A pesticide, for purposes of this report and as defined under federal law, is a broad nonspecific term that includes insecticides, herbicides, fungicides, and other agents.*

4. *Food and Drug Administration Pesticide Program: Residue Monitoring 1999, page 6-7, Food and Drug Administration, March 2000.*

5. *Status Summary of the Organophosphate Review Process, U.S. EPA, Web site - http://www.epa.gov/pesticides/op/status.htm.*

6. *PQPA Safety Recommendations for Organophosphates, U.S. EPA, Office of Pesticide Programs, August 1998.*

7. *"Baby Food Company Reduces Use of Organophosphates on Peaches," World Food Regulation Review, November 1998.*

8. *Ky. Department of Agriculture, August 2000.*

Measures - notes and sources

Measure 1. *Food samples screened for parts per billion of chlorinated pesticides and .05 parts per billion of organophosphates. If other contaminants are suspected, additional testing is conducted. Residue levels detected have been below tolerance standards since 1990. Source: Ky. Department for Public Health.*

Blood Lead Levels in Children

Indicator 8. Blood Lead Levels in Children

At a Glance

Number of blood lead screenings of children
1994 32,447
1998 35,576
2000. 21,412

Number of children with blood lead poisoning
1994 302
1998 327
2000. 318

Number of children with blood lead levels of concern
1994 4,150
1998 4,220
2000 1,806

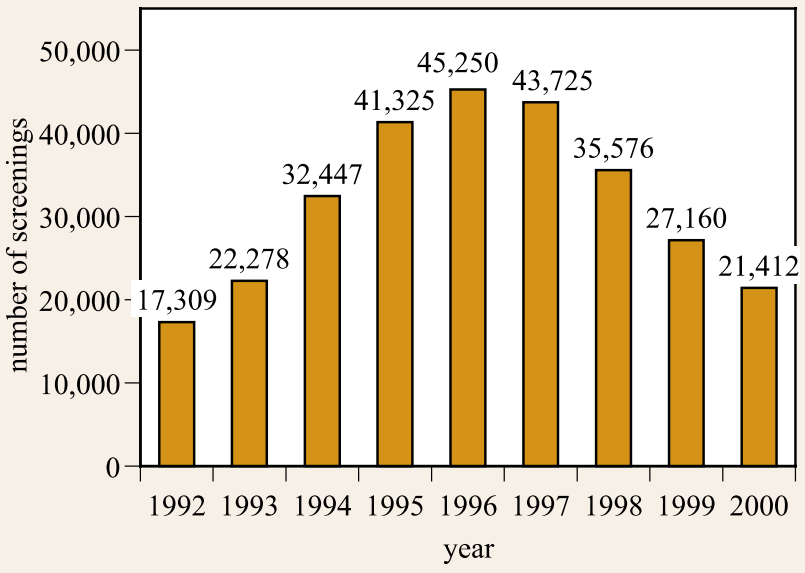
Background Lead poisoning is considered to be one of today's most preventable child health problems. About one in 11 children in America has high levels of lead in his/her blood, according to the Centers for Disease Control and Prevention. The long-term effects of lead exposure in a child can include learning disabilities, decreased growth, hyperactivity, impaired hearing and even brain damage. If caught early, these effects can be limited by reducing exposure to lead or by medical treatment.

The use of lead in consumer products has dramatically declined since the 1970s and 80s. Leaded gasoline was phased out beginning in 1985 and after Dec. 31, 1995 was no longer available in the United States. Lead-based paint was banned for domestic use in 1978. But the historic deposition of lead in soils remains a problem, particularly in urban areas. Lead-based paint in older homes has become a primary source of lead exposure to children. The U.S. Department of Housing and Urban Development estimates that 64 million dwellings, 75 percent of the homes built before 1978, have lead-based paint.[1] An estimated 875,000 homes in Kentucky could contain lead-based paint, 148,750 of which are home to children under six years of age—the age group most susceptible to lead poisoning.

Goal In 1991, the U.S. Public Health Service established the goal of eliminating childhood lead poisoning by 2011.[2] In conjunction with this goal, the Centers for Disease Control and Prevention (CDC) issued guidelines calling for children age one through five to be screened for lead exposure. In 1997, the CDC determined that there was a declining trend of average blood lead levels in children and revised its guidelines to better target children at risk.[3]

Progress The Kentucky Cabinet for Health Services conducts programs for lead poisoning prevention, child blood-lead testing and public education about the hazards of lead. In 2000, local health departments conducted 21,412 blood-lead screenings of children under the age of six. The tests found that 318 children (1.48 percent of those tested) had blood lead levels of 20 micrograms per deciliter of blood (µg/dl) or above, high enough to cause severe and

Measure 1. Blood Lead Screenings in Kentucky Children



adverse health impacts. Another 8.4 percent of the children tested (1,806) had blood lead levels of concern (10 to 19 µg/dl) which could result in behavioral and developmental problems. The U.S. EPA has issued new lead standards to better protect the health of children. These standards are designed to lower the amount of lead a child is exposed to in his or her environment.[4]

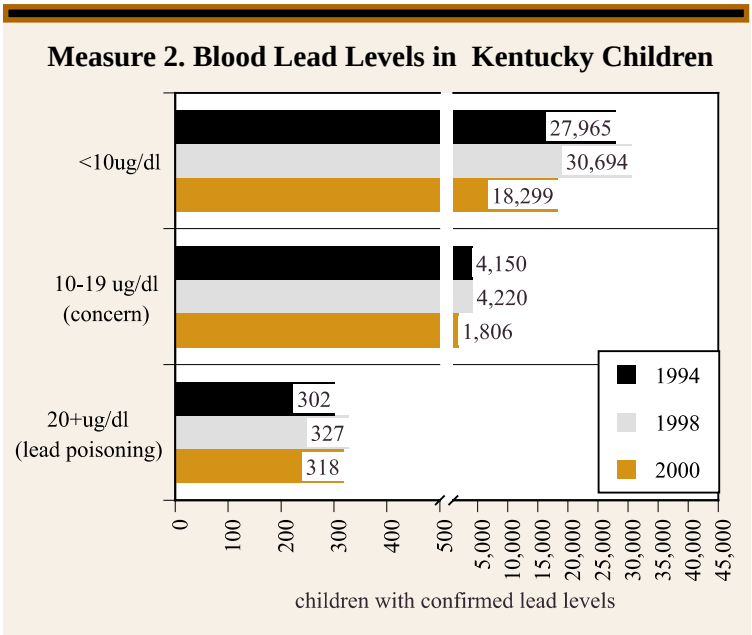
Over the past four years, there has been a dramatic decline in the number of children screened for lead poisoning by local health departments. The Cabinet for Health Services attributes the decline in part to the implementation of the Medicaid Managed Care in two regions, which has resulted in the use of private providers in lieu of local health departments. This has made tracking lead testing difficult. State officials also report that many private physicians do not regularly screen children for lead and that the problem of lead in children may be greater than what is currently known. The Cabinet plans on implementing better tracking procedures for lead blood testing and encouraging private physicians to test their patients for lead.

Footnotes

1. "Everything you ever wanted to know about regulations but were afraid to ask," U.S. EPA, Web site - http://www.epa.gov/region08/community_resources/muni/other/olead.html.
2. CDC Performance Plans, Centers for Disease Control, Web site - http://www.cdc.gov/od/perfplan/2000xiilead.htm.
3. CDC's Lead Poisoning Prevention Program, Centers for Disease Control, Web site - http://www.cdc.gov/nceh/lead/factsheets/leadfcts.htm.
4. "EPA Announces Tough New Standards for Lead," U.S. EPA, Press Release, December 26, 2000.

Measures - notes and sources

Measure 1. *New data collection system started in 1996. Source: Ky. Department for Public Health.*



Measure 2. *µg/dl- micrograms per deciliter of blood. New data collection system started in 1996. Source: Ky. Department for Public Health.*

Chapter 6

Natural Resources

NATURAL RESOURCES

LAND COVER AND DEMOGRAPHICS

Indicator 1. Land Cover and Demographics

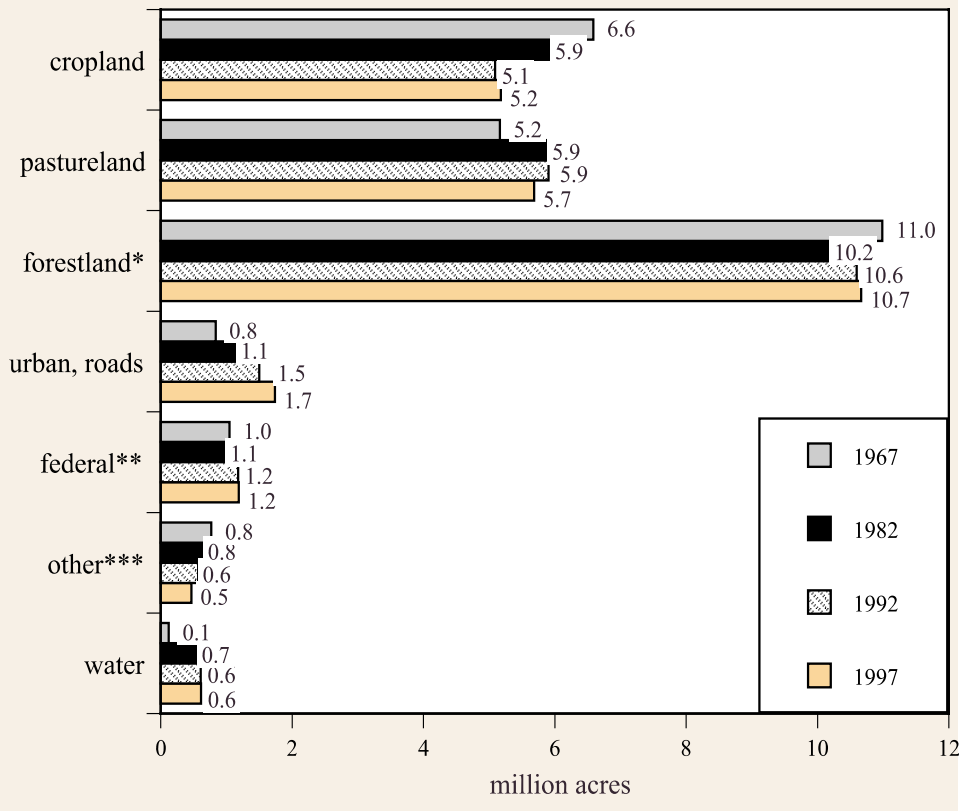
Background Kentucky's landscapes are the most varied in the Eastern United States, encompassing mountains, rolling lowlands and flat plains.[1] The 25.6 million acres of land in Kentucky is composed of crop and pastureland (42 percent); private, municipal, state and county forests (42 percent); urban areas and roads (7 percent); federal lands including the Daniel Boone National Forest, Land Between the Lakes National Recreation Area and military bases (5 percent); with the remainder in surface water and other areas.[2]

Use and management of Kentucky's land constantly changes in response to demographic and economic factors. These forces have created some of the most hotly contested issues facing the Commonwealth today, including the siting of new power plants and large poultry farms as well sprawling unplanned development that gobbles up huge tracts of farmland and forests.

Goal Assure the development of public and private property in the most appropriate relationships (KRS 100.183).

Progress Kentucky is a largely rural state. The state remains number one in the nation for the number of farms. But the farm economy has witnessed hard times during the past 3 decades, and Kentucky farmland has declined by 900,000 acres. Some of this land has reverted back to forests. Kentucky gained half a million acres in forestland between 1982 and 1997. However, the greatest percent change in land use patterns during the three decades can

Measure 1. Land Use Patterns in Kentucky



At a Glance

Kentucky population
1990 3,685,000
2000. 4,041,769

Percent land use
farmlands* 42%
forests**. 42%
urban/road 7%
federal*** 5%
other 4%

Acres per day in Kentucky converted to urban areas. 109

Counties with land use planning 48

Communities with independent planning units 78

**Crop and pastureland in active use.*
***Private, municipal, state and county-owned forestlands.*
****National parks and national forests, military bases.*

Land Cover and Demographics

be seen in the growth of urban areas and roads.

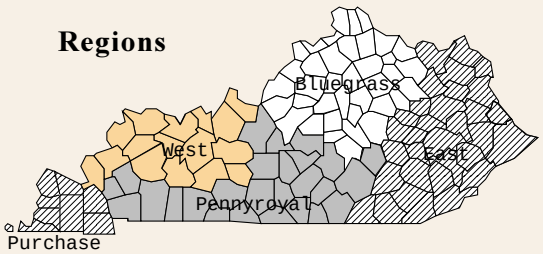
The acres of land converted to urban areas and roads more than doubled between 1967 and 1997, a reflection of Kentucky's growing population and economy. The 2000 census set Kentucky's resident population at 4,042,760, a 9.7 percent increase over the 1990 population. In the 1990s, Kentucky's population grew almost 14 times faster than it did in the 1980s. Much of the growth occurred along interstate highways and in suburban areas outside cities.[3] Kentucky added nearly a quarter-million homes during the 1990s. The growth rate for housing (18 percent growth rate between 1990 and 2000) exceeded the population growth of 9.7 percent, with 1.75 million houses, apartments, cabins and mobile homes. Much of this growth has occurred in Kentucky's "golden triangle" encompassing Lexington, Louisville and Northern Kentucky. Spencer County saw the greatest growth with a 73 percent increase in population and housing, followed by Boone County (49 percent population and 55 percent housing).[4] Many Kentuckians are also flocking to the state's scenic lakes and forests. The number of seasonal or recreational homes in Kentucky jumped 45 percent in the 1990s.[5] Menifee County saw a 53 percent increase in homes, 24 percent of which were vacation homes near the Daniel Boone National Forest.[6]

On average, 109 acres a day are converted to urban areas and roads in Kentucky.[7] A study by the American Planning Association found that between 1982 and 1997, Kentucky developed its land more rapidly per capita than any other state, with the exceptions of Pennsylvania and West Virginia. According to the association, an average of 47,793 acres of land were developed annually in Kentucky during this period. In the Bluegrass region, urban land grew by 60 percent between 1982 and 1997 while pas-

Measure 2. Regional Land Use Trends in Kentucky

Region	1982 acres	1992 acres	1997 acres	1982 - 97 % change
East				
cropland	333,900	216,700	246,100	-26.3
pastureland	743,900	1,031,800	1,066,200	43.3
forestland*	5,465,100	5,205,200	5,165,700	-5.5
urban	240,100	336,300	379,300	58.0
federal**	781,700	857,200	857,200	9.7
water	86,100	90,300	90,400	5.0
other***	228,900	142,200	74,800	-67.3
Bluegrass				
cropland	1,348,400	1,183,100	1,226,900	-9.0
pastureland	2,534,200	2,308,600	2,089,300	-17.6
forestland*	1,158,500	1,390,400	1,443,200	24.6
urban	418,200	566,700	670,200	60.3
federal**	14,400	13,300	13,300	-7.6
water	106,800	112,600	114,400	7.1
other***	85,200	88,400	106,900	25.5
Pennyroyal				
cropland	1,738,800	1,601,400	1,602,000	-7.9
pastureland	1,622,800	1,595,600	1,560,600	-3.8
forestland*	1,877,100	1,901,100	1,890,400	0.7
urban	233,600	293,100	343,300	47.0
federal**	230,000	263,000	246,300	7.1
water	170,300	173,400	174,600	2.5
other***	92,700	92,600	98,900	6.7
West				
cropland	1,709,600	1,480,100	1,457,000	-14.8
pastureland	837,100	769,300	775,800	-7.3
forestland*	1,555,700	1,685,800	1,757,200	13.0
urban	173,000	205,000	230,700	33.4
federal**	65,300	65,000	65,000	-0.5
water	118,400	123,000	125,900	6.3
other***	256,900	201,200	141,900	-44.8
Purchase				
cropland	803,500	610,200	646,200	-19.6
pastureland	221,400	196,700	193,600	-12.6
forestland*	388,100	416,300	410,500	5.8
urban	80,400	99,300	114,000	41.8
federal**	5,400	5,400	5,400	0.0
water	102,000	105,300	106,000	3.9
other***	35,900	41,800	42,000	17.0

Regions



ture and cropland declined by 27 percent.[8]

The most recent economic boom, which began in 1992 and has been the longest in U.S. history, has helped to fuel economic expansion and growth across the Commonwealth. Kentucky's gross state product (GSP) has increased every year since 1986 (using 1996 constant dollars). Kentucky's GSP exceeded $100 billion in 1997.[9] Real GSP grew 34 percent between 1990 and 1998.[10] However, this expansion may end this year based on state projections.

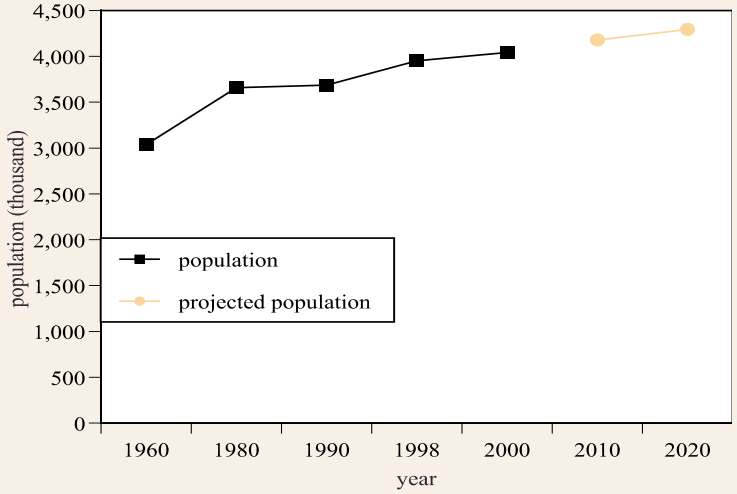
Economic and suburban growth have created numerous land use conflicts across the state. Only 48 of Kentucky's 120 counties have countywide planning; 26 also have zoning. Another 78 communities have independent planning units. But that still leaves many communities without the proper tools to adequately plan for and address the many issues associated with urban sprawl and development.

In the 2000 and 2001 sessions of the General Assembly, several bills were introduced to address growth issues. Most notable was House Bill 524, filed in the 2001 Session, which provided incentives for counties to adopt comprehensive "smart growth" policies and encourage regional coordination to ensure compatible growth policies.[11] However, the measure was not considered during the session.

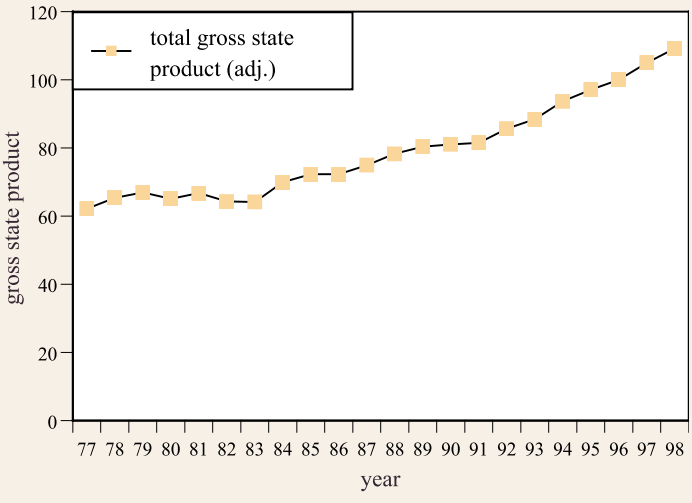
Smart growth recognizes connections between development and quality of life. It leverages new growth to improve communities while also preserving open space and many other environmental amenities.[12] The smart growth movement seeks to clean and recycle inner city brownfields while concentrating growth within existing city neighborhoods instead of the suburbs. It also promotes new sustainable urban neighborhoods where housing, circulation, schools, shopping, public open space, libraries, recycling, and composting are well designed and integrated.[13] On May 17, 2001, Gov. Patton announced the formation of a Smart Growth Task Force. The task force is charged with developing options to incorporate smart growth policies within state and local government operations.

One bill related to smart growth that was passed during the 2001 Kentucky legislative session was the "Voluntary Environmental Remediation Act," better known as the brownfields bill. Brownfields are abandoned, idle, or under-used industrial or commercial facilities where redevelopment is complicated by environmental contamination. Many sites that were once used for industrial purposes have been abandoned, and potential developers are reluctant to use these sites because of the liability they pose for any contamination that may be

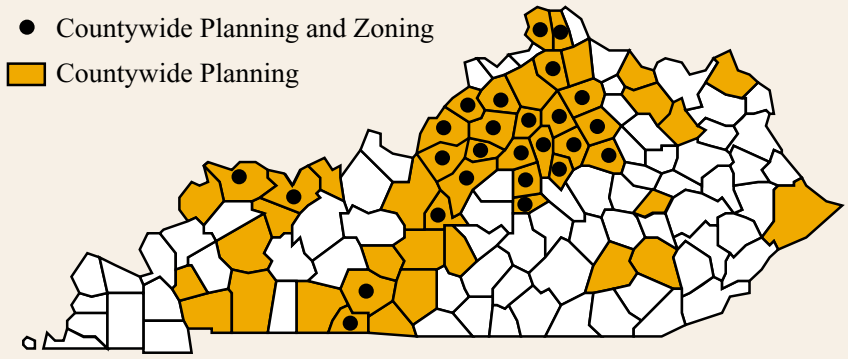
Measure 3. Population Trends in Kentucky



Measure 4. Economic Trends in Kentucky



Measure 5. County Land Use Planning in Kentucky



present on the site. Developers are more attracted to sites in pristine, undeveloped areas to avoid liability issues. Development of these undeveloped sites, termed "greenfields," contributes to urban sprawl and unplanned urban expansion. The legislation builds on existing law to define the process to identify and manage or remove contaminants at brownfield sites. Provisions of the bill also address owner liability issues associated with brownfield redevelopment.

Footnotes

1. Kentucky Alive, Report of the Biodiversity Task Force, 1995.
2. 1997 National Resources Inventory: Highlights, U.S. Natural Resources Conservation Service.
3. "State grew much faster in the 1990s than in 1980s," Peter Baniak, Lexington Herald-Leader, December 12, 2001.
4. "State's housing boom," by John Cheves, Lexington Herald-Leader, May 23, 2001.
5. Ibid.
6. Ibid.
7. Based on a gain of 595,600 acres of urban areas and roads from 1982 to 1997 as determined by the Natural Resources Conservation Service National Resources Inventory, Web site - http://www.ky.nrcs.usda.gov/nri/change.htm.
8. Natural Resources Inventory 1982 to 1997, Natural Resources Conservation Service.
9. In real dollars.
10. Ky. Department for Economic Development, Bureau of Economic Analysis.
11. Bill summaries, Legislative Research Commission, Web site - http://www.lrc.state.ky.us.
12. Why Smart Growth: A Primer by International City/County Management Association, by Geoff Anderson, July 1998.
13. "Who Benefits From Smart Growth?," By Faisal Roble, city planner Los Angeles, Planners Network Online, Nov. 1999.

Measures - notes and sources

***Measure 1**. Data differs from the 1996-97 State of the Environment report due to revisions/enhancements that have been made by the statiticians at Iowa State University and Washington DC. In addition to this, an error in the statistical software was identified back in December, 1999. The error was corrected and the official data re-released in December, 2000. *Private, municipal, county and state forestlands. **Federal lands including national forest and parkland and military bases. ***Farmsteads and other land in farms (i.e. greenhouses, nurseries, poultry facilities), barrenland (i.e. strip mines, quarries), and marshland. Source: U.S. Natural Resource Conservation Service.*
***Measure 2**. Data differs from the 1996-97 State of the Environment report due to revisions/enhancements that have been made by the statiticians at Iowa State University and Washington DC. In addition to this, an error in the statistical software was identified back in December, 1999. The error was corrected and the official data re-released in December, 2000. *Private, municipal, county and state forestlands. **Federal lands including national forest and parkland and military bases. ***Farmsteads and other land in farms (i.e. greenhouses, nurseries, poultry facilities), barrenland (i.e. strip mines, quarries), and marshland. Source: U.S. Natural Resource Conservation Service.*
***Measure 3**. Source: U.S. Census, Ky. State Data Center.*
***Measure 4**. Adjusted using the chained type quantity index for GSP using 1996 as the base year. The chained dollar method is the most contemporary accepted measure of gross state product utilized to generate inflation-free estimates. Sources: Ky. Cabinet for Economic Development, U.S. Department of Commerce, Bureau of Economic Analysis.*
***Measure 5.** Source: Ky. Chapter of the American Planning Association.*

Indicator 2. Agricultural Lands and Products

Background While Kentucky's population continues to shift to urban areas, the state remains primarily an agricultural land. In 1999, farmlands covered an estimated 42 to 54 percent (10.9 to 13.6 million acres) of Kentucky's land area.[1] About half of this acreage is in crop production, and half is in pastureland. Farmlands range from a high of 309,000 acres in Christian County to a low of 2,230 in Martin County. Most farms are located in the central and western parts of the state.[2]

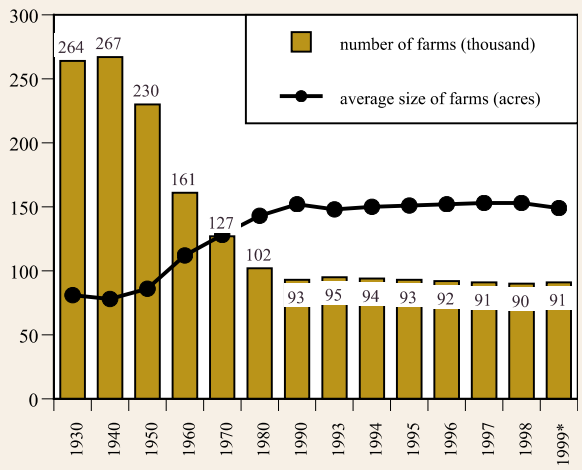
Kentucky ranks 4th in the nation in the number of farms. Primary responsibility for the stewardship of Kentucky's 91,000 farms is in the hands of small family farmers.[3] Nearly 75 percent of Kentucky's farms (61,860) range from 1 to 179 acres.[4] Although the number of farms has decreased during the past decade, the average size has increased to 151 acres in 2000, likely due to the consolidation of farmland by fewer landowners.[5]

Kentucky farms produce numerous goods and services and are the state's largest industry, generating nearly $3.5 billion in sales during 1999. Crop sales totaled $1.3 billion, and livestock sales generated $2.16 billion. Tobacco is the leading agriculture crop in Kentucky, followed by hay, corn, soybeans and winter wheat. Kentucky farm s also produce livestock, including horses, cattle and calves, milk cows, hogs and pigs, and poultry. Kentucky has more cattle than any state east of the Mississippi River. Other products include eggs, plants and foliage, fruits and vegetables, and bees and honey.

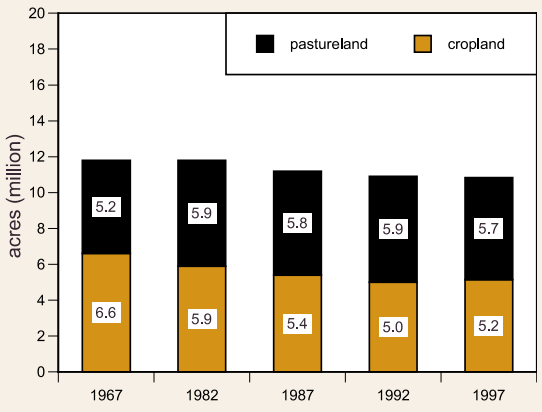
Goal To conserve, protect and to encourage development and improvement of the state's agricultural lands for the production of food and other agricultural products.

Progress Kentucky agriculture has witnessed much change during the past century. Kentucky's largest cash crop, tobacco, continues to face uncertainty about its future. The number of general family farms has declined as farming has become more

Measure 1. Number and Average Size of Farms in Kentucky



Measure 2. Crop and Pastureland in Kentucky



At a Glance

Acres of farmland in Kentucky (million acres)
1967. . . . . .11.8
1987. . . . . .11.2
1997. . . . . .10.9

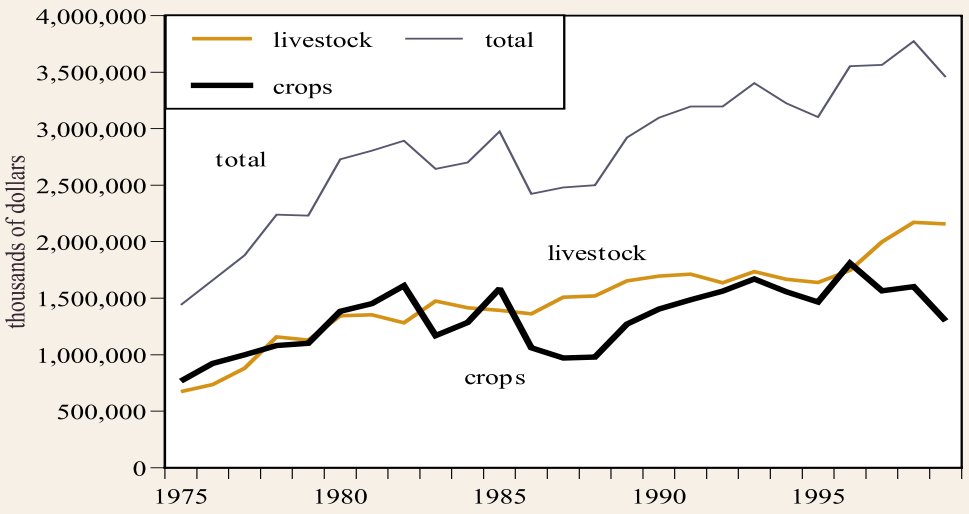
Number of farms in Kentucky
1970. 127,000
1980. 102,000
1999. 91,000

Number of small family farms in Kentucky (1 to 179 acres)
1982 78,641
1987 69,616
1997. 61,860

Cash receipts generated by farms in Kentucky
1970 . . . . . .$77 million
1980 . . . . . .$2.7 billion
1999 . . . . . .$3.5 billion

Agricultural Land

Measure 3. Kentucky Cash Receipts from Kentucky Farms



specialized and more commercially driven. Farm acreage continues to shift to other uses with urban sprawl and development claiming thousands of acres of farmland. Environmental issues associated with "concentrated animal feeding operations" (CAFOs) have become a concern in the state, in response to the growing broiler industry. In Kentucky, broiler production increased from 64.5 million in 1995 to 188.8 million in 1999.[5]

Efforts to address the many challenges confronting Kentucky farmers and the state's agricultural lands are ongoing. In July 1998, Gov. Paul Patton established the Governor's Commission on Family Farms to focus exclusively on the interests of Kentucky's farm families and rural communities. The commission has worked on marketing assistance, diversification, labor assistance, urban / rural partnerships and infrastructure and market development for new crops and products.

Kentucky is also moving forward in exploring new opportunities for farms through the use of tobacco settlement monies. The state will receive $180 million in monies over the next two years from a trust established by several tobacco companies as part of a $206 billion court settlement with 46 states.[6] The Kentucky Agricultural Development Board was created by the 2000 General Assembly to administer and distribute the tobacco settlement monies. The board will invest these funds in innovative proposals that increase net farm income and are designed to help tobacco farmers and communities.

Footnotes

__1__. Kentucky Agricultural Statistics Service indicates that 13.6 million acres of land are covered by crop and pastureland based on the Kentucky Agricultural Statistics 1999-2000, while the Natural Resources Conservation Service reveals that 11.9 million acres are in crop and pastureland based on its 1997 Natural Resources Inventory.

__2__. Kentucky Farm Count by Congressional District, 1997 Census of Agriculture, Web site - http://www.nass.usda.gov/census/census97/congdist2/states/kentucky/ky.htm.

__3__. "Kentucky Farm Numbers Down In 2000," Press release, 2/26/01, Ky. Agricultural Statistics Service.

__4__. Ibid.

__5__. Kentucky Agriculture Statistics 1999-2000, page 70, Ky. Agricultural Statistics Service.

__6__. History of the National Tobacco Growers Settlement Trust, Commonwealth of Ky., Web site - http://kytobaccotrust.state.ky.us/History.htm

Measures - notes and sources

Measure 1. **1999 numbers are estimates. Farmland defined as a place that sells or could sell $1,000 of agricultural products during the year. Source: U.S. Census of Agriculture, 1950-1945; U.S. Department of Agriculture National Agriculture Statistics 1950-2000.*

Measure 2. **Farmland is defined as a place that sells or could sell $1,000 of agricultural products during the year. Source: U.S. Department of Agriculture, National Resource Inventories, 1967-97.*

Measure 3. *Source: Ky. Agricultural Statistics Service, Ky. Agricultural Statistics 1999-2000.*

Indicator 3. Farmland Preservation

Background Kentucky's farmlands continue to be lost to development and other uses. Between 1967 and 1997, Kentucky lost 8 percent (900,000 acres) of its farmlands to other uses.[1] Kentucky's prime farmland, those acres with best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, continue to declined as well. The amount of prime crop and pastureland in Kentucky fell from 5.26 million acres in 1982 to 4.707 million acres in 1997, a drop of 553,000 acres. Data reveals a loss of prime crop and pastureland between 1982 and 1997 of 85,000 acres.

Goal To conserve, protect and encourage development and improvement of the state's agricultural lands for the production of food and other agricultural products.

Progress Several programs have been created to provide incentives to protect farmlands from conversion and keep these lands in agricultural use. The Kentucky Agricultural District Program was created in 1982. Since then 2,551 landowners in 63 counties amounting to 322,188 acres have been enrolled in the program.[2] The advantages of participating in the program include lower property value assessments (which reduce taxes) and protection from annexation when cities expand into rural areas.

Purchase of Agricultural Conservation Easements (PACE) was established by the General Assembly in 1994. The program authorizes the state to purchase agricultural conservation easements in order to ensure that lands currently in agricultural use will not be converted to other uses. The PACE program has received $2.3 million in state and federal funds to purchase agricultural conservation easements. An additional $10 million in funding was made available by the 2000 Kentucky General Assembly as part of the tobacco settlement agreement. To date, 14 easements have been purchased (3,388 acres). Six farmers have also donated easements of 1,020 acres, bringing the total PACE Program inventory to 4,408 acres.[3] Negotiations are currently underway on five more farm easements totaling 2,128 acres.

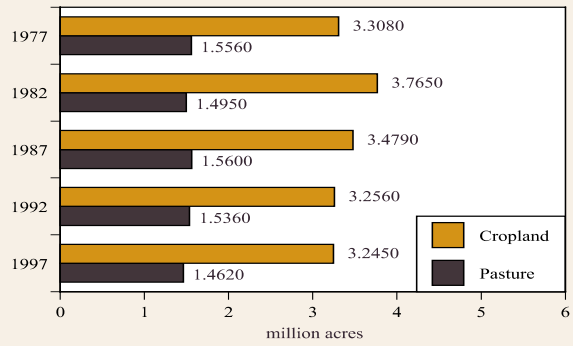
In 2000, the Lexington-Fayette Urban County Government initiated a purchase of development rights program to protect farmland. The goal of the program is to preserve more than 50,000 acres of rural land in Fayette County. The program is funded by state and local money, $15 million coming from the Kentucky Agricultural Development Bond Fund and approximately $25 million coming from local bonds. To date, 36 farmers have submitted applications totalling 6,700 acres.[4]

At a Glance

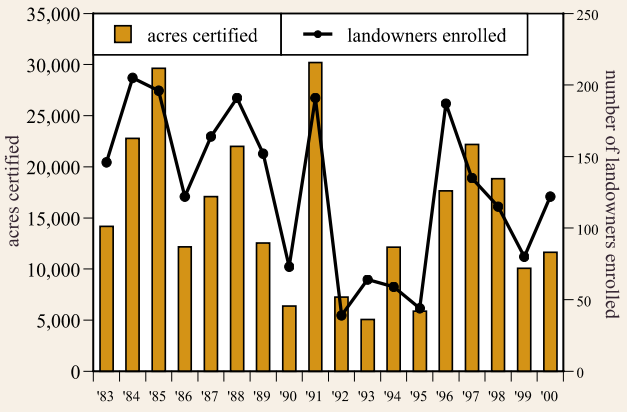
Prime crop and pastureland in Kentucky (million acres)
1977. . . . . .4.864
1982 . . . . . 5.260
1987. . . . . .5.039
1992 . . . . . 4.792
1997. . . . . .4.707

Agricultural lands protected (acres)
Ag. districts. . .322,188
PACE easement . .4,408

Measure 1. Prime Crop & Patureland in Ky.



Measure 2. Agriculture District Program in Ky.



Footnotes

1. 1997 National Resources Inventory, U.S. Natural Resources Conservation Service, 2000 .
2. Ky. Division of Conservation.
3. Ky. Department of Agriculture, 2001.
4."Waiting for the Green," Laura Oppenheimer, Lexington Herald-Leader, February 1, 2001.

Measures - notes and sources

Measure 1. *Source: National Resources Inventory 1977-1997, U.S. Department of Agriculture.*
Measure 2. *Source: Ky. Division of Conservation.*
Measure 3. *Source: Ky. Division of Conservation.*

Farmland Conservation

Indicator 4. Farmland Conservation

At a Glance

Farmlands needing conservation treatment
1982. . . . . 6,790 acres
1992. . . . . .5,893 acres
1997 . . . . . not available

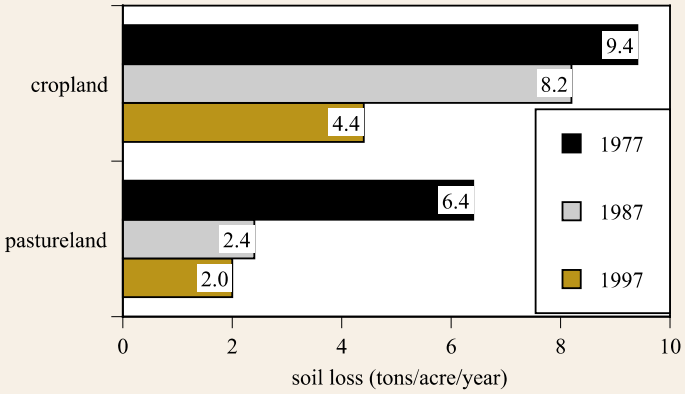
Farmland using conservation tillage (acres)
1982 . . . . . .3 million
1997 . . . . . 3 million
2000. . . . . 2 million

Background There are a number of factors that affect farmland productivity including weather, insects, disease, seed quality and soil conditions. New technologies and products, particularly fertilizers, pesticides and improved seed varieties, have greatly increased crop yields and production levels of Kentucky's cash crops.

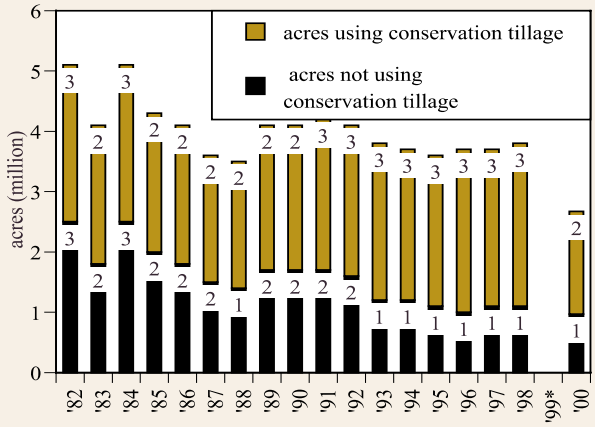
Erosion of topsoil can greatly affect farmland productivity while also degrading the quality of Kentucky's waterways. Siltation is the second leading source of water pollution in Kentucky.[1] Agricultural activities are the leading source of water pollution, contributing 25 percent of the pollution problems found in monitored waterways.[2] During 1997, an estimated that 22.8 million tons of soil eroded from cropland in Kentucky.[3] The U.S. Natural Resources Conservation Service has ranked 2.7 million acres of Kentucky's farmland as highly erodible. The agency estimates that half of the state's crop and pastureland is in need of erosion control measures.[4]

Goal To conserve, protect and encourage development and improvement of the state's agricultural lands for the production of food and other agricultural products.

Measure 1. Farmland Soil Erosion Rates in Kentucky



Measure 2. Conservation Tillage Use in Kentucky



Progress The amount of agricultural land requiring conservation treatment declined by 13 percent from 1982 to 1992, in part because of land retirement, but also because of the use of soil-conserving crop management practices such as conservation tillage.[5] The use of conservation tillage in Kentucky, a farming technique that disturbs less soil, has resulted in a dramatic reduction of soil loss. Erosion rates on cropland have declined from an average of 8.4 tons per acre per year in 1987, to 4.4 tons per acre per year in 1997. Pastureland erosion rates have dropped from 3.0 tons per acre per year in 1987 to 2.0 tons in 1999. It is estimated that 64 percent of Kentucky's farmland utilizes conservation tillage practices.

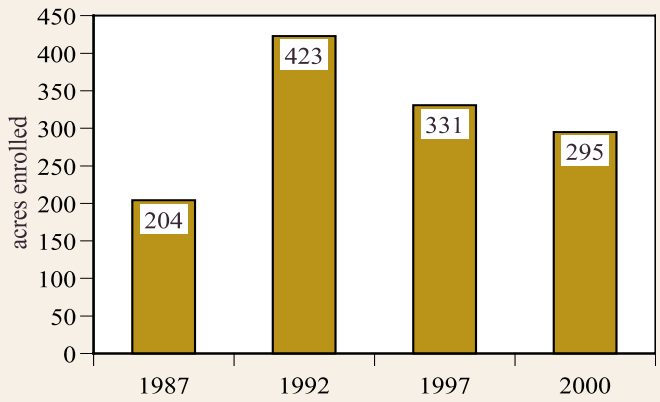
In 1985, Congress created the Conservation Reserve Program (CRP) to help farm owners and operators conserve and improve soil, water, air and wildlife resources by converting highly erodible and other environmentally sensitive land to a long-term (10 to 15 years) resource-conserving cover. In exchange, the federal government makes annual rental payments to the landowner and shares the cost of installing approved conservation practices. Nationwide, some 33.5 million acres are enrolled in the CRP.[6] Participation in the CRP has declined in Kentucky over the past decade, from a high of 423,000 acres in 1992 to 295,000 acres in 2000. This decline is due to the expiration of enrollment contracts of several farmers and expanded use of conservation tillage systems, which has allowed for greater farming of erodable lands with minimal disturbance of soils.[7]

The Kentucky Soil Erosion and Water Quality Cost Share Program was established by the General Assem-

bly in 1994. The program provides technical and financial assistance to individuals to implement Best Management Practices (BMPs) on farms or in woodland operations to improve water quality. The fund grew to more than $11 million in 2000. The program has funded 2,659 agricultural cost share practices to date. The program remains very popular, as indicated by the fact that the state has only been able to fund 37 percent of the 7,181 applicant requests.[8]

Efforts to control pollution from agricultural operations continue. The Kentucky Agriculture Water Quality Act, passed in 1994, requires all farms that are more than 10 acres in size and that meet the definition of an agricultural operation to develop and implement water quality plans to protect water quality and prevent pollution. To date, 32,592 agriculture operations (36 percent of the state's 91,000 farms) have voluntarily filed plans with state conservation districts.

Measure 3. Conservation Reserve Program in Kentucky



Footnotes

1. 305b Report to Congress 1998 and 2000, Ky. Division of Water.
2. Ibid.
3. Based on 5.2 million acres of cropland with an average erosion rate of 4.4 tons/acre/year. Source: 1997 National Resources Inventory.
4. 1997 National Resources Inventory, U.S. Natural Resources Conservation Service, 2000.
5. The U.S. Natural Resources Conservation Service did not conduct a conservation treatment inventory in 1997. The next inventory is scheduled in 2002.
6. Conservation Reserve Program (CRP) Signup, U.S. Department of Agriculture, Farm Service Agency.
7. Ky. Division of Conservation, May 2001.
8. Ibid.

Measures - notes and sources

***Measure 1**. Source: National Resource Inventories, 1982-97, Natural Resources Conservation Service.*
***Measure 2**. *No survey conducted in 1999. Source: Natural Resources Conservation Service.*
***Measure 3**. Source: National Resource Inventories, Natural Resources Conservation Service, 1982-97.*

Concentrated Animal Feeding Operations

Indicator 5. Concentrated Animal Feeding Operations (CAFOs)

At a Glance

Broiler production in Kentucky
1990. 1,520,000
1995. 64,500,000
1999. 188,000,000

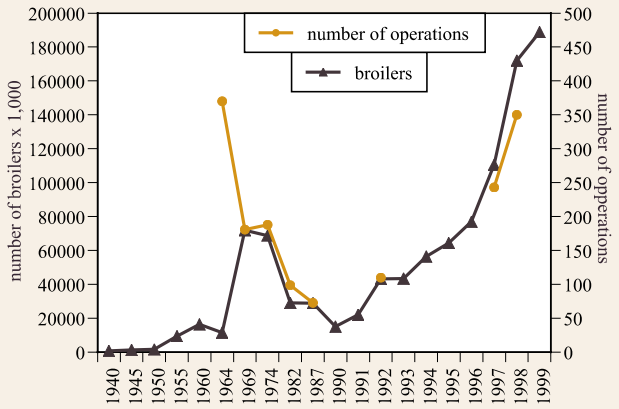
Number of concentrated animal feeding operations
U.S. 12,660
Kentucky. 250

Background The trend toward "corporate farming," the raising of animals owned by large corporations on a contract basis with farmers, has emerged as a major economic, social and environmental issue in Kentucky. Kentucky has witnessed a significant increase in the number of concentrated animal feeding operations (CAFOs) within the past few years.[1] The increase in the number of CAFOs is primarily due to the siting of poultry houses brought on by demand from three chicken processing plants that located in Kentucky during the past several years. Broiler production has increased from 22 million in 1992 to 188 million in 1999.[2] Many farmers are contracting with corporations to raise poultry and other livestock in large concentrated feeding operations.

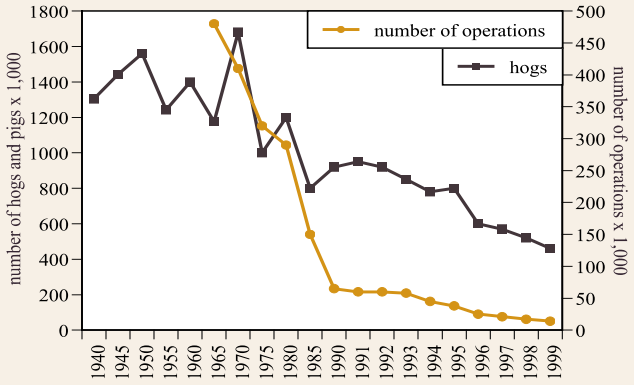
The environmental, health and quality-of-life impacts of concentrated animal feeding operations have become a growing concern in the state. CAFOs can produce large quantities of waste, which has the potential to pollute ground and surface water if not properly managed. For example, a CAFO with 2,500 hogs may produce 1.25 million gallons of waste a year. An operation with 100,000 head of laying hens or broilers can produce 600 tons of litter per year. The waste can create odor problems and contaminate land and water resources.

The U.S. Department of Agriculture estimates that there are 12,660 CAFOs in the United States.[3] There are estimated 250 CAFOs in Kentucky, 90 percent of which are in the western region of the state. McLean County has the largest number of CAFOs in Kentucky, with 36. Eighty six percent of McLean County's CAFOs are poultry operations.[4]

Measure 1. Broiler Production and Number of Farms Producing Broilers in Kentucky



Measure 2. Swine Production and Number of Farms Producing Swine in Kentucky



Goal Protect public health and welfare from the environmental and health threats posed by animal confinement facilities and land application of manure.

Progress State efforts to address environmental and other issues associated with CAFOs have been ongoing for the past four years. The Kentucky Natural Resources and Environmental Protection Cabinet filed its first CAFO regulations in 1997. Those regulations focused on swine operations. The regulations expired in April 2000.

The agency issued another set of emergency regulations in Feb. 2000. The regulations were expanded to address poultry, swine and cattle CAFOs and established CAFO permit conditions for water pollution discharge permits as specified in the U.S. Department of Agriculture and the U.S. Environmental Protection Agency's joint "Unified National Strategy for Animal Feeding Operations" directive issued on March 9, 1999. The regulation also included siting standards for the construction of any new CAFO facilities and provisions that hold both the producer and integrator responsible in the management of animal waste. The regulations were estimated to

affect less than 250 operations in the state (including 176 poultry operations and 64 swine operations). The Kentucky Farm Bureau challenged the regulations alleging the state overstepped its statutory authority. The regulations sunsetted (expired) in April 2001.

Another set of emergency CAFO regulations went into effect on March 23, 2001. These regulations also specify water permits, siting requirements and integrator liability provisions. The constitutionality of the regulation was challenged by several farm organizations. On May 25, 2001 the Franklin Circuit Court declared the regulation void because it was similar to a regulation that had previously expired due to a legislative subcommittee veto. The state has since challenged the legality of the legislative veto process and has asked the court to allow the CAFO regulation to remain in effect until a decision is rendered.

Several counties in Kentucky have also enacted ordinances to protect private property from the impacts of CAFOs including Allen and Cumberland counties, and the city of Marion in Crittenden County.

Efforts are also underway to help farmers better manage animal feeding operations. Funding has been provided to Animal Feeding Operations (AFOs) under the Kentucky Soil Erosion and Water Quality Fund. To date, the program has funded 2,659 agricultural cost-share practices. During 2000, 544 of the 877 practices funded were for animal waste structures. These AFOs were provided $9.3 million of the $10.7 million in cost-share funds allocated in 2000. In addition to these cost-share funds, a portion of the $180 million in state monies ($18 million) received from the master tobacco settlement agreement will be used to help farmers address environmental issues associated with agricultural operations.

Footnotes

1. Under state regulations, a CAFO is defined as a farm with at least 1,000 beef cattle, 700 dairy cattle, 100,000 laying hens or broilers, or 2,500 swine weighing 55 lbs. or more, or a facility that houses 300 animal units and discharges to the waters of the Commonwealth.

2. Kentucky Agricultural Statistics, 1999-2000, page 70.

3. National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitations Guidelines and Standards for Concentrated Animal Feeding Operations, Page 60, U.S. EPA., December 15, 2000.

4. Kentucky Division of Water.

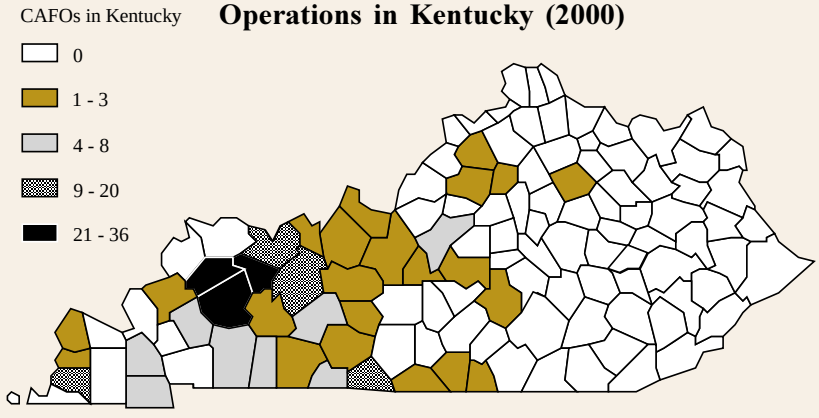
Measures - notes and sources

Measure 1. *Data incomplete, number of poultry operations was not collected on a regular basis. Definition of the number of farms changed in 1975 to a place that sells or could sell $1,000 of agricultural products during the year. Source: Ky. Agriculture Statistics.*

Measure 2. *Definition of the number of farms changed in 1975 to a place that sells or could sell $1,000 of agricultural products during the year. Source: Ky. Agriculture Statistics.*

Measure 3. *Source: Ky. Division of Water.*

Measure 3. Concentrated Animal Feeding Operations in Kentucky (2000)



Forest Resources

Indicator 6. Forest Resources and Utilization

At a Glance

Percent of land covered by forests . . . 46-48%

Percent of growing timber considered large enough for lumber .58%

Board feet of timber harvested in Kentucky
1974. . .342 mill. bd. ft.
1997 . .1.1 billion bd. ft.

Cords of pulpwood harvested in Kentucky
1974. 133,100
1997. 223,000

Lumber production in Kentucky (million board feet)
1960 310
1988 811
1999 900

Number of logging operations inspected
. 1,760

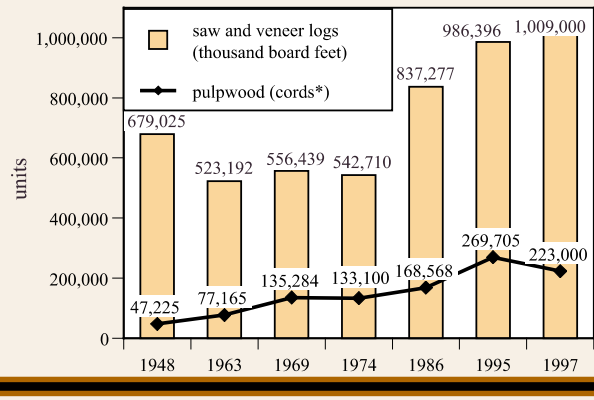
Number of enforcement actions at logging operations 203

Background Forestland covers an estimated 46 to 48 percent (11.9 to 12.7 million acres) of the state's 25.6 million acres of land.[1] The U.S. Forest Service periodically monitors the condition and availability of timber resources in Kentucky. U.S Forest Service inventories in Kentucky have been conducted in 1949, 1963, 1975, and 1987. The 2000-01 forest inventory for Kentucky is currently underway.

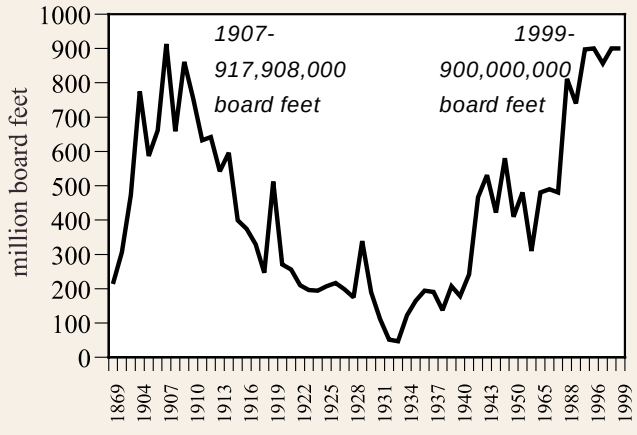
During 1987, (the most recent data available), 58 percent of timber in Kentucky was considered sawtimber (nine inches in diameter for softwood and 11 inches in diameter for hardwood) large enough to be utilized for lumber. Kentucky's forests are being cut at record-high levels due to this timber availability and worldwide demand. During 1997 (the most recent year data available), harvesting of saw and veneer logs (based on surveys of wood-using plants) in Kentucky was estimated at 1.1 billion board feet.[2] Pulpwood production reached record levels in 1995.[3] Lumber production in Kentucky was near record levels during 1999 at 900 million board feet. Another indicator of growing demand for wood products is the price paid for timber. Demand continues to drive up stumpage prices. For example, mixed hardwood stumpage prices rose by almost 27 percent in just one year (1998-1999).[4]

Goal Promote the sustainability of Kentucky's forest ecosystems.

Measure 1. Forest Harvesting Trends in Kentucky



Measure 2. Lumber Production Trends in Kentucky



Progress In response to increased logging of forests, the General Assembly passed the 1998 Kentucky Forest Conservation Act.

The Forest Conservation Act provides loggers with four opportunities to correct erosion and other environmental problems associated with timber harvesting operations. Between July 15, 2000 and Feb. 15, 2001, the Kentucky Division of Forestry had inspected more than 1,760 logging operations and had taken 203 enforcement actions (159 written warnings, 23 informal conferences, four notices of violations, three special orders, and 14 emergency orders). The act also provides for a "bad actor" designation and civil penalties if loggers and operators fail to comply. No loggers have been given bad actor status.

The act requires master loggers at all timber operations. Between 1992 and 2000, a total of 3,663 loggers have graduated from the state master logger program. The program was established in 1992 to train loggers about practices to prevent erosion, proper harvesting practices, safety and other issues.

Footnotes

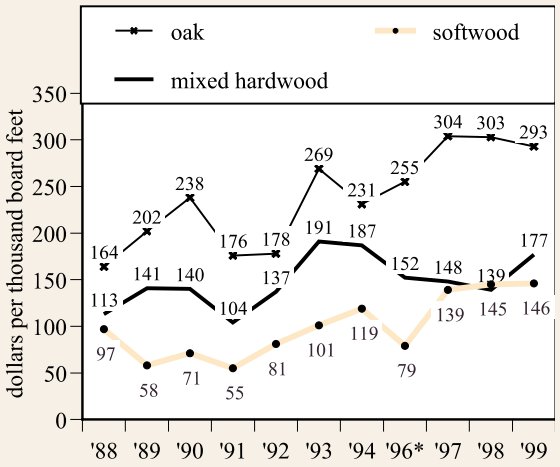
1. The U.S. Forest Service Survey of 1987 indicated 48% (12.7 million acres of Kentucky's land base is covered by private and public forests while the U.S. Natural Resources Conservation Service 1997 Natural Resources Inventory found 46% (111.9 million acres) are in private and public forestlands.

2. Based on saw and veneer logs. "Kentucky's Timber Industry—An Assessment of Timber Product Output and Use," 1997, Daniel Stratton and Larry Lowe, Southern Research Station, SRS 40, Table 10, July 1999.

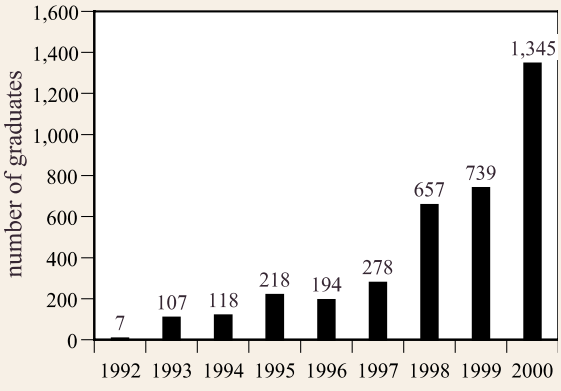
3. Ibid.

4. Statewide delivered log prices are now available on the Ky. Department of Agriculture Web site - http://www.kyagr.com (see wood promotion program).

Measure 3. Average Sawtimber Stumpage Prices for Private Woodlands in Kentucky



Measure 4. Kentucky Master Loggers



Measures - notes and sources

***Measure 1**. Note: Earlier data not available. Based on data collected from the timber product output surveys. The surveys canvass all primary wood-using plants in Kentucky and other states to determine the level of harvests from Kentucky forests.*
Source: U.S. Forest Service.

***Measure 2**. Note: This chart represents lumber produced by mills in Kentucky. This also includes lumber produced from logs (roundwood) brought in from other states, as well as logs (roundwood) harvested in Kentucky. Source: Ky. Division of Forestry, U.S. Forest Service.*

***Measure 3**. Note: Adjusted for inflation using consumer price index for 2000. *1994-1996 data based on estimates. 1995 data not available. Source: Timber Mart-South; Stumpage Price Mart; University of Ky., Department of Forestry; Ky. Division of Forestry.*

***Measure 4**. Source: Ky. Division of Forestry.*

Public Forestland

Indicator 7. Public Forestland

At a Glance

Percent of Kentucky land base covered by public forests 2%

Largest track of public forestland in Kentucky
DBNF . . 695,000 acres

Timber harvests on public forestland
■DBNF
1989 . . 45.1 mill. bd. ft.
1999. . . 1.5 mill. bd. ft.
■LBL
1989 . . . 7.1 mill bd. ft.
1999. . . . . .0 bd. ft.
■State forests
1989. . 1.19 thou. bd. ft.
1999. . . . . 0 bd. ft

Background Public forestlands make up about 896,622 acres or 2 percent of Kentucky's land base, according to 1988 U.S. Forest Service data. These public forests support a wealth of biological diversity and contribute significantly to the state's $8.8 million tourism industry.[1]

The Daniel Boone National Forest (DBNF) is the largest block of publicly owned lands in Kentucky. The DBNF covers over 695,000 acres within 21 eastern Kentucky counties. The Land Between the Lakes National Recreation Area (LBL) encompasses 170,000 acres in western Kentucky and Tennessee. Other public forests include the Mammoth Cave National Park, five state forests,[2] 40 state nature preserves and 33 state wildlife management areas. Some of these public lands are open to timber harvesting including the DBNF, state forests and the LBL.

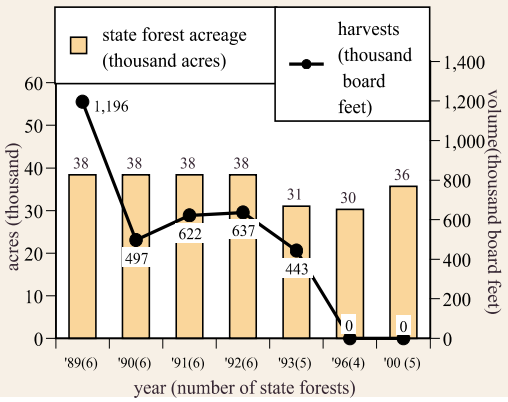
Goal Promote the sustainability of Kentucky's forest ecosystems.

Progress

State Forests. Kentucky's five state-owned forests support recreation, hunting, fishing and camping uses. Timber harvests on state forests were suspended in 1996 to conduct inventories of the forests. The inventories will provide data necessary to manage the forests as ecosystems. An Ecosystem Management Plan has been drafted for the Pennyrile State Forest. Data collection is now underway to develop the Kentucky Ridge State Forest Plan. The Pennyrile State Forest Plan contains a set of "Guiding Principles for Ecosystem Management on Kentucky State Forests," a history of the forest, a description of the forest and individual watersheds, inventory methods used, and a set of goals and strategies to achieve the plan's objectives.

Daniel Boone National Forest. Each year, an estimated 5 million people visit the Daniel Boone National Forest. In addition, the forest provides habitat to dozens of species of wildlife including 36 federally threatened and endangered species. Efforts are underway by the U.S. Forest Service to revise the Daniel Boone National Forest Land and Resource Management Plan with an emphasis on sustainability, ecosystem health, multiple benefits to people, collaboration and use of the best available science. The plan is expected to be drafted by 2002-2003. Timber harvests also occur on the DBNF. Timber sales reached an all-time high in 1989 at 45.1 million board feet, but since then have dropped 76 percent in 1999 when 1.5 million board feet was harvested from the forest. The decline in timber sales is attributed to a new emphasis on recreation and ecosystem management, as well as lawsuits and appeals challenging timber sales.

Measure 1. Harvesting Trends in State Forests of Kentucky



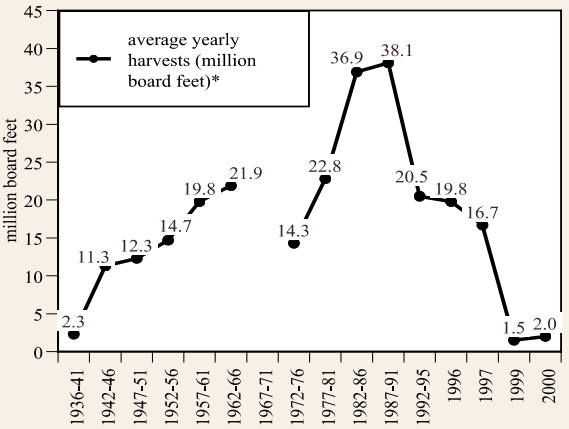
Land Between the Lakes National Recreation Area. In 1994, the Tennessee Valley Authority (TVA) developed the LBL Forest Management Plan, which included forest management practices. In the plan, TVA proposed to sell an average of 5.3 million board feet of timber a year over the next decade. The U.S Forest Service assumed management of the LBL in 1999. At that time all timber sales were suspended. Timber sales will resume in 2001. The U.S. Forest Service plans to prepare its own Land and Resource Management Plan for the LBL in the next few years.

Footnotes

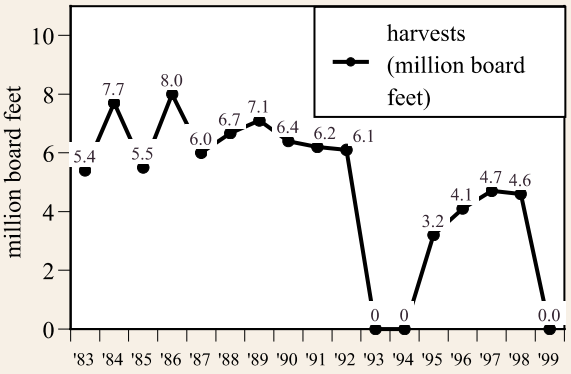
1. *In 2000, travelers to Kentucky spent $8.8 million. This spending generated $777,109,116 in state tax revenues and employed 163,486. Tourism is Kentucky's third largest industry and second largest employer. Source: Ky. Tourism Cabinet.*

2. *Kentucky's 5 state forests are:* ***Pennyrile Forest*** *(14,654 acres in Christian, Hopkins, Caldwell counties) – Four tracts (201 acres) have been added to the forest since 1996. These tracts were purchased for the purpose of consolidating forest through the elimination of in-holdings.* ***Kentucky Ridge Forest*** *(15,251 acres in Bell County) – Two tracts (3,888 acres) were added to the Kentucky Ridge State Forest since 1996 for use as timber management, wildlife management, recreation and education. One tract will also protect a large area of the north face of Pine Mountain.* ***Kentenia Forest*** *(4,227 acres in Harlan County) - Since 1996, two tracts totaling 653 acres have been added to the forest for the purpose of road access and connecting two existing tracts.* ***Tygarts Forest*** *(800 acres in Carter County).* ***Green River State Forest*** *(703 acres in Henderson County) - This is a new 703-acre state forest that was acquired through an interagency deed of conveyance with the Economic Development Cabinet and the Finance Cabinet on July 20, 1998. It is a bottomland hardwood ecosystem.*

Measure 2. Logging Trends in the Daniel Boone National Forest



Measure 3. Logging Trends in Land Between the Lakes National Recreation Area



Measures - notes and sources

Measure 1*. Source: Ky. Division of Forestry.*

Measure 2*. *Based on 4-year averages 1936-1995. 1936-61 are actual average harvest volumes for those years depicted, 1976-93 data represents averages for volume sold under contract which may not necessarily be what was harvested that year. Data not available for 1967-71. Source: U.S. Forest Service.*

Measure 3*. Source: Tn. Valley Authority, U.S. Forest Service, Ky. Division of Forestry.*

Forest Management

Indicator 8. Forest Stewardship and Management on Private Woodlands

At a Glance

Number of forestland owners in Kentucky. 306,900

Acres of private forestland in Kentucky. . . . . 11.4 million

Percent of forestland owned by private landowners 93%

Average woodland tract . . . . . 30.4 acres

Percent of private forestland with forest plans 16%

Background Many experts agree that managing Kentucky's forests in a sustainable manner and building a diverse forest industry will require a strong program of landowner assistance and education.

There are more than 306,900 private forestland owners in Kentucky. These landowners own about 93 percent of the 12.7 million acres of forestland in the state.[1] The average woodland tract is 30.4 acres. Currently, the state employs 40 field foresters—that amounts to 7,673 landowners for every state forester.

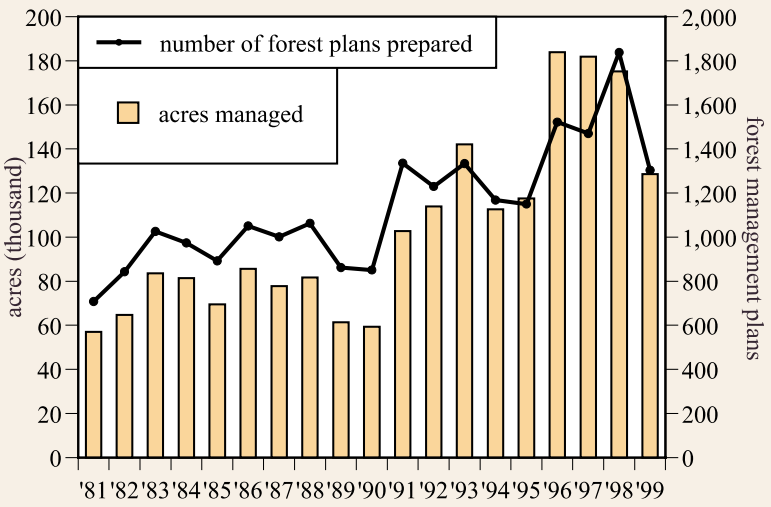
Goal Promote the sustainability of Kentucky's forest ecosystems.

Progress It is difficult to determine the level of forest management in Kentucky given the fact that there are so many landowners and acres of private forestland in the state. However, one indicator which can be used to track forest stewardship and management is the number of forest plans prepared by the Kentucky Division of Forestry. The preparation of forest plans is one of the most requested services by landowners. Between 1981 and 1999, the Kentucky Division of Forestry and its cooperators worked with landowners to prepare 21,623 forest plans covering 1.94 million acres of forestland. This represents 16 percent of the 11.4 million acres of private forestland in the state.

Other services requested by landowners through the state's Forest Stewardship Program include tree planting, timber marking and improving a forest stand. However, the reduction in federal funding of the Forest Stewardship Incentive Program, which finances up to 50 percent of landowner costs to manage their forestland, has impaired the state's ability to promote these types of practices. This federal program was not funded in 1999 or 2000. Kentucky continues to operate the cost-share program with money recovered from defaulted cost-share practices. Speculation is that there may be a new forestry cost-share program proposed in the national 2002 Farm Bill. The Kentucky Forest Conservation Act, passed in 1998, included a state Forest Stewardship Incentives Fund to assist in funding a cost-share program for landowners. However, funding has not yet been provided by the General Assembly to implement the program.

Most landowners requesting assistance from the Division of Forestry cite good forest

Measure 1. Forest Plans Prepared for Private Woodlands in Kentucky



management as their top priority (75 percent), followed by wildlife management (23 percent). The Kentucky Division of Forestry is now in the process of developing a plan to improve its outreach efforts to educate landowners about forest management practices and programs. The Kentucky Division of Forestry has contracted with a marketing firm to conduct a survey of forest landowners to determine their attitudes and motivations about forest stewardship. An outreach plan will be developed based on the survey findings.

Footnotes

***1**. Forestland as estimated by the U.S. Forest Service in Private Forestland Owners of the U.S., 1994.*

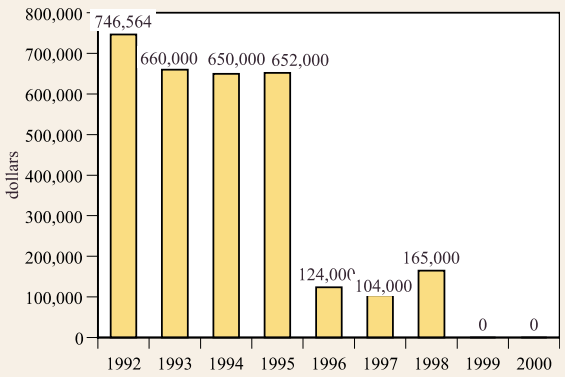
Measures - notes and sources

***Measure 1**. Includes Forest Management Plans and Forest Stewardship Plans prepared by the Ky. Division of Forestry, Ky. Forestry Industry and Ky. Association of Consulting Foresters (KACF). Data not available from KACF for the years 1994-1997. Source: Ky. Division of Forestry.*

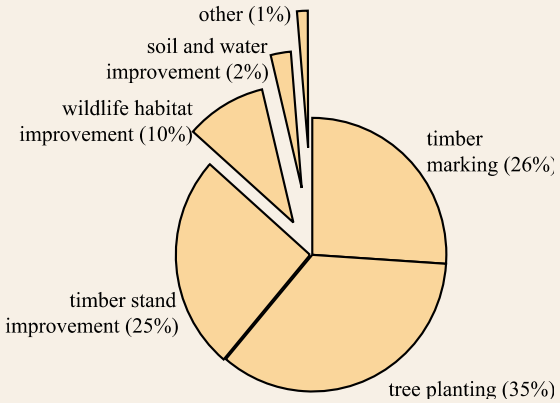
***Measure 2**. Source: Ky. Division of Forestry.*

***Measure 3**. Based on 453 landowner requests for assistance to the Ky. Division of Forestry in 2000. Other includes site preparation for natural regeneration and riparian area improvement. Source: Ky. Division of Forestry.*

Measure 2. Funding of Federal Forest Stewardship Incentive Programs in Kentucky



Measure 3. Forest Practice Requests in Kentucky



Forest Industry

Indicator 9. Forest Industry

At a Glance

Kentuckians employed by the wood industry 38,000

Direct value of wood industry in Kentucky. . . . . $5.17 billion

Number of primary wood producers
1994 615
1999. 510

Number of secondary wood producers
1994. 449
1999. 514

Background The state's forest industry is composed of primary producers, such as sawmills, and secondary manufacturers which make a product such as furniture, from wood materials. In 1999, 510 primary and 514 secondary wood companies were operating in the state.

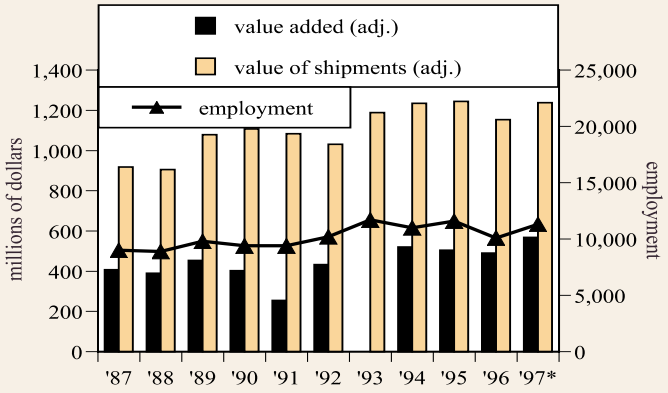
According to the 1997 census, the most recent year data is available, the lumber and wood industry employed 11,319 people with a value of shipments at $1.2 billion.[1] However, an assessment conducted by the Kentucky Cabinet for Economic Development places the direct value of the Kentucky wood industry at $5.17 billion and employment levels at 38,000.[2]

Goal Promote the most efficient utilization of Kentucky's forest resources.

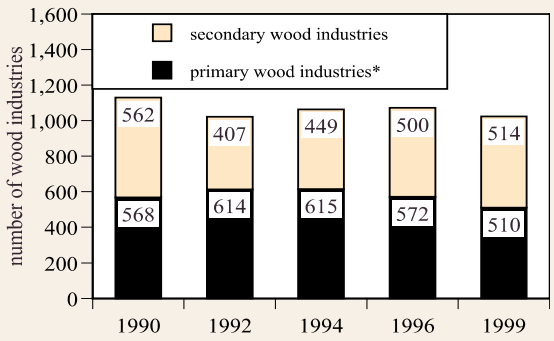
Progress Kentucky continues to see a decline in the number of primary wood producers in the state. Since 1994, the number of primary wood industries has declined 17 percent; from 615 to 510 primary producers. The decline is attributed to a consolidation of production by larger producers. According to state forestry officials, some of the lumber mills are increasing capacity and/or acquiring smaller mills.

Efforts are also underway to strengthen the state's secondary forest industry. While Kentucky is the third leading hardwood-producing state in the country, it accounts for only one percent of the nation's secondary wood industry employment. Recognizing the potential of the secondary wood industry to add jobs and diversify local economies, the state created the Kentucky Wood Products Competitiveness Corporation. The corporation was established in 1994 to enhance the secondary wood products industry and promote "Kentucky made" wood products. Since then, 65 new secondary wood industries have located in Kentucky, a 14 percent increase in a 5-year period.

Measure 1. Kentucky Lumber and Wood Industry Economic Trends



Measure 2. Wood Industry in Kentucky



Footnotes

1. Industry Statistics for the State: 1997, U.S. Census Bureau, 1997 Economic Census, May 8, 2000.

2. Based on sales from primary, secondary, and pulp/paper. 2000 National IMPLAN Conference, Kentucky's Secondary Wood Products Industry, Phil Flynn, Staff Economist, Division of Research, Ky. Cabinet for Economic Development, October 12-13, 2000.

Measures - notes and sources

***Measure 1**. Note: Adjusted for inflation using the consumer price index for 2000. 1993 value added data not available. *Data for 1997 from the U.S. Census Bureau, 1997 Economic Census. Source: U.S. Census Annual Survey of Manufacturers, U.S. Census 1997 Economic Census.*

***Measure 2**. *Includes pallet manufacturers. Source: Ky. Division of Forestry.*

Indicator 10. Forest Fires

Background Wildfires are one of the greatest threats to Kentucky's forests. For the past 10 years, Kentucky has averaged 1,447 wildfires that burned 44,801 acres annually. The intensity of wildfires is primarily the result of dry and windy weather conditions. In 1999, private forestland acreage burned was the fourth highest on record, due to drought conditions experienced that year. While wildfires occur in every county, the heavily forested eastern region leads the state with most burned acreage, with Pike County leading the state.

Arson was responsible for more than half of the wildfires occurring on private woodlands during the past 10 years. This cause was followed by debris burning at 28 percent and carelessness from smoking at 3 percent.

Goal Improve, maintain and protect the health and condition of Kentucky's forest resources.

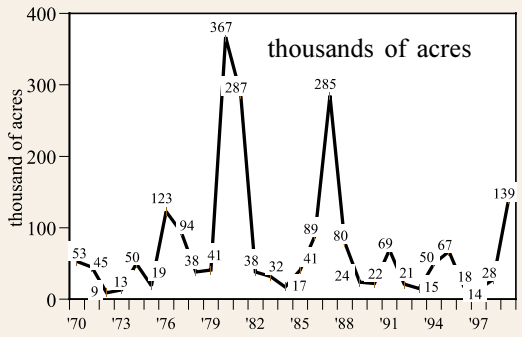
Progress The state provides for wildland fire detection, suppression and law enforcement. Counties are assessed two cents per woodland acre with funds going to the Kentucky Division of Forestry ($228,000 was collected in 2000). The money is apportioned back to counties to help with fire suppression. The state also has partnerships with the National Guard, Department of Corrections, Southern Forest Fire Compact and the U.S. Forest Service to supplement Kentucky Division of Forestry wildfire suppression resources.

In the past few years, the state has made the prosecution of arsonists a top priority. However, it is often difficult to catch arsonists in the act. For example in 1999, 1,349 forest wildfires burning 111,452 acres in Kentucky were attributed to arson. However, only four felony arson citations were issued; three of those resulted in convictions.

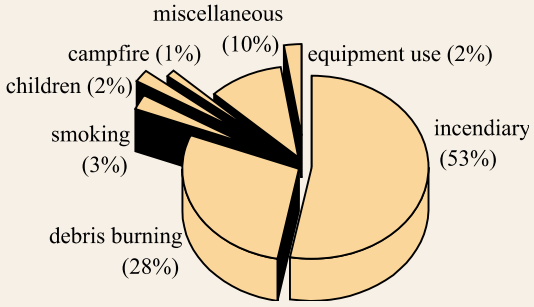
U.S. Forest Service officials report that arsonists contribute to the majority of wildfires on the Daniel Boone National Forest as well. Extreme drought conditions intensified fire behavior activity during 1999 and 2000, burning more than 25,000 acres.

Prescribed fire is a tool used by trained individuals to manage vegetation to create and maintain specific forest conditions. For the past several years, prescribed fires have been used on the Daniel Boone National Forest to improve habitat conditions for species, such as the endangered red-cockaded woodpecker, dependent on the southern pine ecosystem. The U.S. Forest Service reports that each burn is conducted by qualified individuals only after ensuring that site conditions such as wind speed, temperature, and relative humidity are within the allowable range.

Measure 1. Forest Wildfires on Private Woodlands in Kentucky



Measure 2. Wildfire Causes on Private Woodlands in Kentucky (1991-2000)



At a Glance

Average number of wildfires per year 1,447

Average acres of forestland burned per year 44,801

Leading causes of wildfire in Kentucky
arson. 53%
debris burning . . 28%

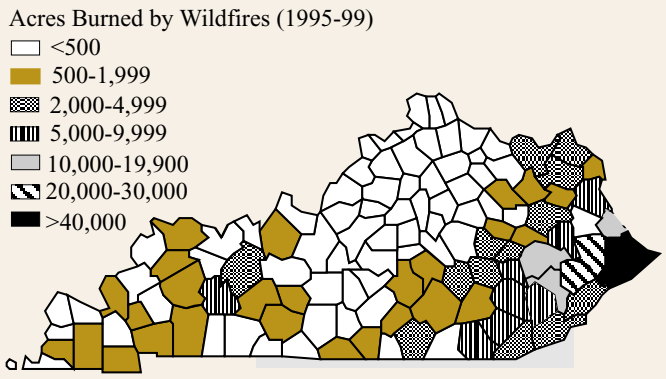
Number of forest fires attributed to arson (1999) 1,349

Number of arson violations issued (1999) 4

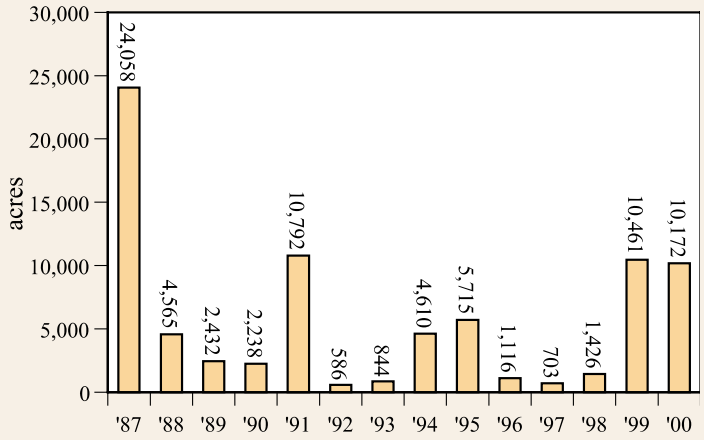
Number of arson convictions (1999) . . 3

Forest Fires

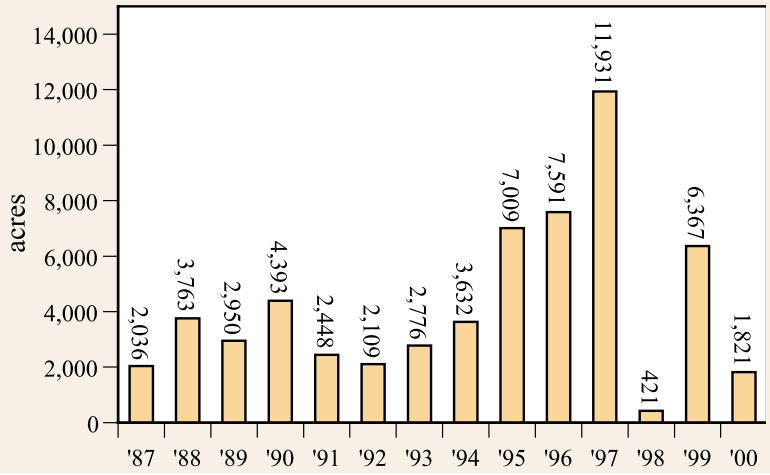
Measure 3. Private Woodlands Burned in Kentucky (1995-99)



Measure 4. Wildfire in the Daniel Boone National Forest



Measure 5. Prescribed Fires in the Daniel Boone National Forest



Measures - notes and sources

***Measure 1**. Excludes federal forestland. Source: Ky. Division of Forestry.*

***Measure 2**. Chart based on 10 year fire totals (1991-2000). Excludes federal forestland. Miscellaneous includes lightning, railroad and other causes. Source: Ky. Division of Forestry*

***Measure 3.** Excludes federal forestland. Source: Ky. Division of Forestry.*

***Measure 4.** Earlier data not available. Source: U.S. Forest Service.*

***Measure 5**. Earlier data not available. Source: U.S. Forest Service.*

Indicator 11. Forest Health

Background There are many factors that affect forest health, including air pollution, wildfires, poor logging practices and numerous pests and diseases. Nonnative invasive species are a particular problem in Kentucky's forests. The chestnut blight fungus, introduced in the United States in the 1940s, all but wiped out this commercially valuable tree species in Kentucky and nationwide. Dutch Elm disease eliminated more than half the elm trees in the country. Dogwood anthracnose, Hemlock woolly adelgid and Butternut canker are diseases also threatening the diversity and health of Kentucky's forests.

In recent years, the gypsy moth, *Lymantria dispar Linnaeus*, has become an increasing threat to forest health in Kentucky. The gypsy moth is one of the most notorious pests of hardwood trees in the Eastern United States. Gypsy moths are spreading at a faster rate than in the past and could infest much of the South and Midwest during the next 30 years. The gypsy moth has been observed primarily in northeastern and eastern Kentucky.

Kentucky is also facing its most severe outbreak of southern pine beetles. The southern pine beetle has long been considered the most destructive insect pest of pine throughout the South. Aerial reconnaissance of the Daniel Boone National Forest indicate that 60 to 80 percent of the pine ecosystem has been impacted by the beetle, resulting in thousands of acres of dead pine trees. Aerial surveys by the Kentucky Division of Forestry revealed an additional 311 infested areas in seven eastern Kentucky counties. Environmental conditions such as drought and mature pine stands have likely contributed to the southern pine beetle epidemic currently occurring in the state.[1]

At a Glance

Threats to Kentucky's forests
- wildfires
- gypsy moth
- southern pine beetle
- dogwood anthracnose
- butternut canker
- hemlock woolly adelgid

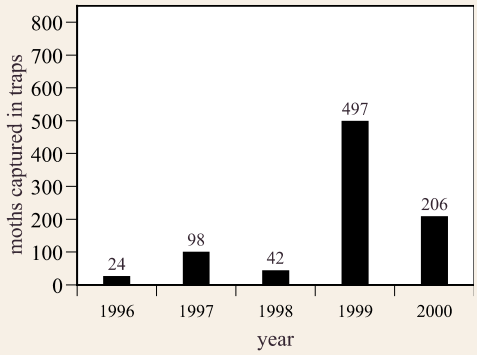
Damage by southern pine beetle
2000. . . 60 to 80% of pine ecosystem impacted

Goal Improve, maintain, and protect the health and condition of Kentucky's forest resources.

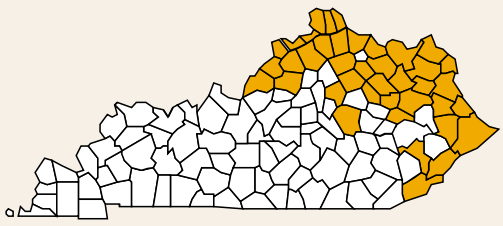
Progress Since 1996, the Kentucky Division of Forestry has conducted gypsy moth surveys in the Commonwealth. The surveys reveal varying population densities of the gypsy moth on state and private forestlands throughout northeast and eastern Kentucky. Currently, populations are at a level where no major forest impacts have been observed.

The 2000 gypsy moth trapping season ended in late August. A total of 1,518 traps were set and 206 gypsy moths were captured. The U.S. Forest Service has also conducted its own gypsy moth trapping surveys on the Daniel Boone National Forest. In 1999, seven moths were captured in Rowan, Bath and Powell counties. One moth was captured in Laurel County in 2000. In 1992, the U.S. Forest Service began a pilot program to test the feasibility of "slowing the spread" (STS) of the gypsy moth. STS pilot programs currently exist in Kentucky, North Carolina, Virginia, West Virginia, and Michi-

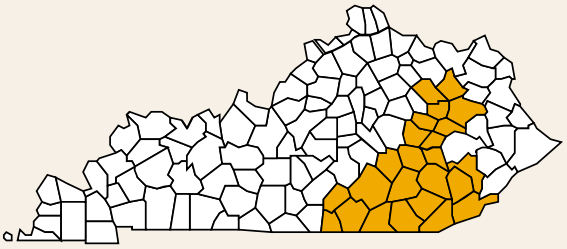
Measure 1. Gypsy Moth Captures in Kentucky



Measure 2. Location of Gypsy Moth Captures in Kentucky



Measure 3. Southern Pine Beetle Activity in Kentucky



gan. The STS project in Kentucky includes Boyd, Bracken, Carter, Greenup, Lewis, Mason, Pendleton and Robertson counties.

The Kentucky Division of Forestry has received federal funds to assist with suppression activities for the southern pine beetle. These activities include continuing aerial detection surveys; initiating ground surveys; identifying and notifying landowners; and providing suppression information to landowners.

Footnotes

***1**. Evaluation of Southern Pine Beetle Outbreak on State and Private Lands in Kentucky, Sara L. Sanders, Ky. Division of Forestry, August 2000.*

Measures - notes and sources

***Measure 1**. Source: Ky. Division of Forestry.*
***Measure 2**. Based on gypsy moth surveys and captures. Source: Ky. Division of Forestry, U.S. Forest Service.*
***Measure 3**. Based on aerial and ground surveys. Source: Ky. Division of Forestry.*

Indicator 12. Tree Planting and Reforestation

Background Interest in tree planting and reforestation is growing in Kentucky. For example, the state has initiated a reforestation project for mined lands. And many communities are working to reforest areas. Reforest the Bluegrass is a partnership of the Lexington/Fayette Urban County Government, the community and sponsors. Reforest the Bluegrass is working to create large urban forests. During 1999 and 2000 more than 1,800 volunteers planted 58,000 tree seedlings on city park property.

It is not known exactly how many trees are planted each year or acres are reforested in Kentucky since data are not available to make an exact determination. The majority of Kentucky's forests are hardwood which can regenerate naturally. Landowners can also implement various regeneration practices to perpetuate their forests. A survey conducted by the Kentucky Forest Industry Association reveals that in 2000, 278,098 acres of private forestland was regenerated naturally and 6,152 acres were replanted.[1] That year the forest industry reforested 2,284 acres naturally and planted 2,284 acres.[2] The single largest source of tree seedlings for reforestation in Kentucky is the Division of Forestry's tree nurseries.[3]

Goal Promote the sustainability of Kentucky's forest ecosystems.

Progress In recent years, the number of seedlings sold from the Kentucky Division of Forestry's two nurseries has averaged 4.4 million per year. Long-term trends reveal, however, that the number of seedlings sold has fallen, likely the result of a decline in surface mining in the state and the use of trees to reclaim mine sites. It is anticipated by state forestry officials that the number of seedlings sold will increase due to local and state reforestation initiatives.

One such initiative currently underway is promoting the reforestation of mine lands. Only a small portion of Kentucky's surface mined areas have been reclaimed to forestland. In an effort to promote forestland as the post mining land use of choice, the Kentucky Department of Surface Mining Reclamation and Enforcement (DSMRE) created a work group to develop a set of guidelines to promote forests on mined lands. The recommendations were incorporated into Reclamation Advisory Memorandum #124 in 1997. Since then, there has been an increase of approximately 15 percent in the number of surface mining applications that propose reforestation as the post mining land use.

The DSMRE was been working closely with the University of Kentucky on the development and construction of approximately 100 acres of reforestation test plots. The ongoing field trails indicate that surface-mined lands are very capable of supporting high-value forests if properly reclaimed. The state recently was awarded a $2 million grant from the federal Office of Surface Mining to promote reforestation of thousands of acres of coal mine lands.

At a Glance

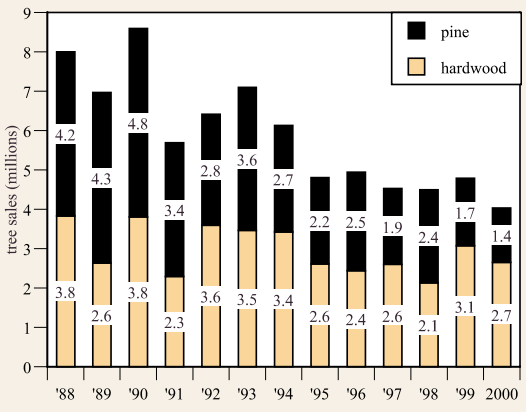
Acres of land requiring reforestation in Kentucky . . unknown

Acres of private forestland regenerated naturally (2000) 278,098

Acres of private forestland replanted (2000) 6,152

Tree seedlings sold from state nurseries . .4.4 million per year

Measure 1. Tree Planting in Kentucky



Footnotes

1. *"The Sustainable Forestry Initiative Report for Kentucky for the Year 2000," Ky. Forest Products Assn.*

2. *The Kentucky Division of Forestry operates two tree nurseries: John P. Rhody Tree Nursery, Gilbertsville and Morgan County Tree Nursery, West Liberty.*

Measures - notes and sources

Measure 1*. Based on seedlings sold from two Ky. Division of Forestry nurseries by fiscal year (July 1- June 30). Source: Ky. Division of Forestry.*

Urban Forests

Indicator 13. Urban Forests

At a Glance

Kentucky population living in urban settings
1990 1,779,947
2000. 1,915,485

Communities with urban forest programs in Kentucky
1995. 72
1999 126

Kentucky communities designated as a tree city USA
1995. 31
1999. 26

Background While Kentucky is typically thought of as a rural state, an estimated 48 percent of the population now lives in what is considered a metropolitan area.[1] The population of Kentuckians living in or near metropolitan areas rose from 1,779,947 in 1990 to 1,915,485—an increase of 135,538 in a 10 year period. This migration has caused a profound impact on existing natural resources and farmland surrounding urban areas. Interest has become high in providing forest settings such as parks, greenways and other lands to enhance recreational opportunities and improve the quality of life in urban and suburban communities.

Goal Develop and enhance urban forest programs throughout the state.

Progress The number of cities in Kentucky with urban forestry programs has doubled since 1993 and now stands at 126. In addition, 26 Kentucky communities are certified as a Tree City USA, thereby improving the natural environment for more than 31,000 residents. The Division of Forestry reports that its urban forestry program reaches nearly two-thirds of Kentucky's populations. The Division of Forestry provides technical assistance to individuals, service organizations, nonprofit groups, and communities in establishing Tree Boards, drafting tree ordinances, conducting street tree surveys, tree planting and maintenance and addressing insect and disease problems.

Federal Urban and Community Assistance Grants have assisted many Kentucky communities in developing local urban forestry programs. Since 1996, $772,304 in assistance grants has been awarded to 140 urban forestry projects across the state. These grants have funded a variety of projects including a master plan for protecting open spaces and water resources in Elizabethtown, an outdoor environmental education center in Estill County and a number of demonstration planting projects in various communities.

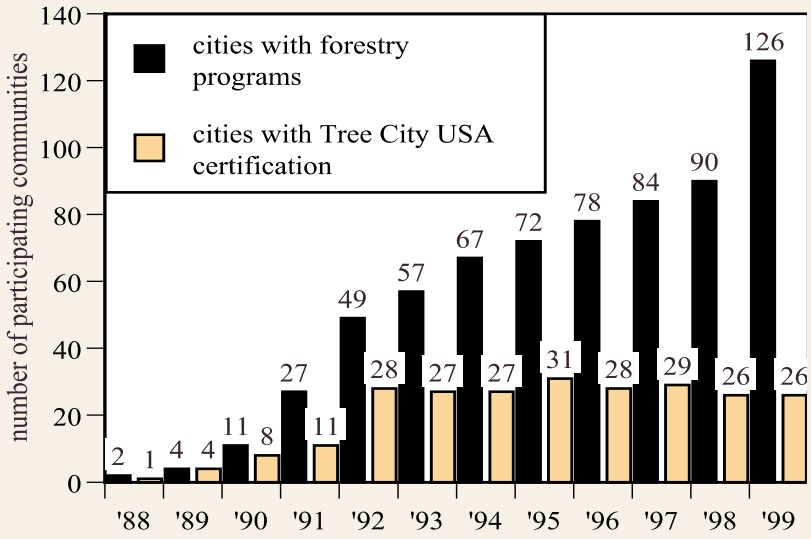
Footnotes

1. *Inside and outside a central city. Source: 1990 and 2000 U.S. Census.*

Measures - notes and sources

Measure 1*. Source: Ky. Division of Forestry*

Measure 1. Urban Forest Programs in Kentucky



Endangered Species

Indicator 14. Threatened, Endangered and Rare Species

Background The diversity of living things, or biological diversity, as it has come to be known, is a fundamental aspect of life on our planet.[1] The concern over biodiversity has heightened in the past 25 years as the world's human population has exceeded 6

One component of biological diversity is the many different kinds of plants, mammals, birds, fish and other organisms that make up our natural world. It has been estimated that there may be up to 204,700 native species in the United States.[2] Thousands of other species, especially insects and microorganisms, have yet to be described and classified.

There are numerous reasons why some of these species have become extinct. Some are naturally rare and were so historically. However, many extinctions have been the result of pollution, habitat alteration and destruction, competition from exotic species and overharvesting. In Kentucky, 45 native species such as the ivory-billed woodpecker, gray wolf, red wolf and eastern cougar no longer exist in the state.[3] Nationwide, more than 1,000 species of wildlife and plants have been listed by the U.S. Fish and Wildlife Service as threatened or endangered.

A number of species, while not listed as federally threatened or endangered, are deemed to be rare in Kentucky. The Natural Heritage Database, the primary source of native species information in the state, currently lists 560 bird, fish, mussel, plant, mammal and amphibian/reptile species that are considered rare or of special concern; that's 18 percent of all those known species in the state.

The Kentucky State Nature Preserves Commission continues to revise the state's listing of rare species. As more information is gathered, additional groups have been added to the list, including mosses, lichens, millipedes and arachnids. The Kentucky Legislature passed the Rare Plant Recognition Act in 1994 to recognize endangered and threatened species of plants. The Nature Preserves Commission is preparing to finalize an official list of rare plants through the regulatory promulgation process.

At a Glance

Kentucky's wild species*. 3,125

Number listed as federally threatened and endangered. 42

Number considered rare 560

Number extinct or extirpated 45

**Does not include insects, arachnids, snails, and crustaceans.*

Goal Identify, protect, manage and recover habitat for animals and plants that are in danger of extinction.

Progress Since the passage of the federal Endangered Species Act in 1973, 5.8 percent of the 18,949 known native species of plants, fish, mussels, amphibians, reptiles, birds and mammals in the United States have been federally-listed as threatened or endangered.[4] Forty-two (1.4 percent) of Kentucky's species have been federally listed as threatened or endangered. Federally-listed threatened and endangered species are known to occur in 101 of the 120 counties of Kentucky.

Kentucky ranks 12th in the nation in the number of federally-listed threatened and endangered species. This ranking is the result of several factors, including the high level of biodiversity found

Measure 1. Top 15 States with Most Threatened and Endangered Species

state	# species	state	# species
1. Hawaii	312	9. Virginia	53
2. California	276	10. Arizona	50
3. Florida	100	11. N. Carolina	48
4. Alabama	99	**12. Kentucky**	**42**
5. Tennessee	88	13. Utah	40
6. Puerto Rico	75	14. New Mexico	38
7. Texas	55	15. Mississippi	32

Measure 2. Species at Risk in the U.S. and Kentucky

	vascular plants	birds	amphibians/ reptiles	mussels	freshwater fish	mammals	total
United States							
total species*	16,108	822	520	305	776	418	18,949
endangered	564	78	24	61	69	63	859
threatened	141	15	30	8	44	9	247
rare***	60	72	72	152	195	30	581
Kentucky							
total species*	2,262	350	103	103	237	70	3,125
federally listed	9	4	0	20	4	4	41*
rare**	372	49	28	36	61	14	560
extinct/extirpated	4	8	1	19	8	5	45

Endangered Species

Measure 3. Federally Threatened/ Endangered Species in Kentucky (2001)

Mammals
Indiana bat
Virginia big-eared bat
Gray bat
Eastern puma

Birds
Bald eagle
Least tern
Red-cockaded woodpecker
Piping plover

Fishes
Blackside dace
Relict darter
Palezone shiner
Pallid sturgeon

Mussels
Clubshell
Fanshell
Cumberland bean
Cumberland elktoe
Cracking pearlymussel
Dromedary pearlymussel
White wartyback pearlymussel
Cumberlandian combshell

Mussels
Littlewing pearlymussel
Pink mucket pearlymussel
Catspaw
Rough pigtoe
Fat pocketbook
Northern riffleshell
Tan riffleshell
Ring pink
Orangefoot pimpleback
Oyster mussel
Winged mapleleaf
Tubercled blossom

Plants
Cumberland rosemary
Cumberland sandwort
Price's potato-bean
Braun's Rock cress
Running buffalo clover
Short's goldenrod
Virginia spiraea
White-haired goldenrod
Eggert's sunflower

Crustacean
Mammoth Cave Shrimp

in the state and the extensive alteration of natural ecosystems that has occurred, such as the clearing of forests and the damming of rivers.

Efforts are underway to restore several species of wildlife and plants in Kentucky. Recent initiatives have focused on the river otter, black bear, elk, peregrine falcon, osprey, White-haired goldenrod, Eggert's sunflower and Braun's rock cress.

Footnotes

1. Kentucky Alive, Report of the Kentucky Biodiversity Task Force, 1995.

2. Precious Heritage: The Status of Biodiversity in the United States, The Nature Conservancy, 2000.

3. Endangered Species Listed in Each State, U.S. Fish and Wildlife Service, Web site - http://ecos.fws.govwebpage/usmap.html, September 1, 2000.

4. General Statistics for Endangered Species, U.S. Fish And Wildlife Service, Web site - http://endangered.fws.gov/stats/genstats.html, May 31, 2000.

Measures - notes and sources

Measure 1. *Threatened and endangered species based on data from the U.S. Fish and Wildlife Service. *Does not include the Mammoth Cave Shrimp (a crustacean) which is also federally-listed as threatened and endangered. Source: Ky. Nature Preserves Commission, U.S. Fish and Wildlife Service.*

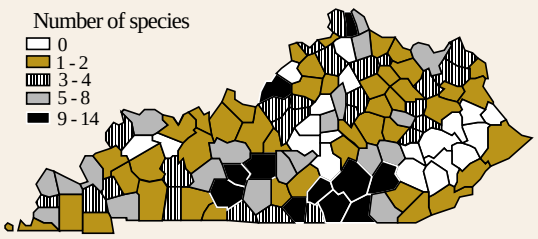
Measure 2. *Does not include insects, arachnids, snails, crustaceans. *Includes native species only. **Species considered threatened and endangered in Kentucky (but not all necessarily rare in other states) as listed by the Ky. Nature Preserves Commission. ***Designated as GX (presumed extinct), GH (possibly extinct), G (critically imperiled) and G2 (imperiled) by the Natural Heritage Central Database. Source: Ky. State Nature Preserves Commission, U.S. Fish and Wildlife Service.*

Measure 3. *Federal listing based on historic range of species. Not all listed species still occur in Kentucky. For example, the eastern puma has been extirpated from the state. Source: U.S. Fish and Wildlife Service.*

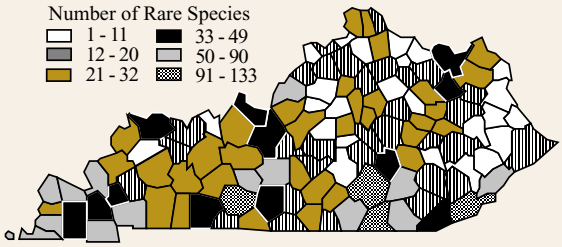
Measure 4. *Source: Ky. State Nature Preserves Commission.*

Measure 5. *Species considered threatened and endangered in Kentucky (but not all necessarily rare in other states) as listed by the Ky. State Nature Preserves Commission. Source: Ky. State Nature Preserves Commission.*

Measure 4. Federally Listed Threatened and Endangered Species in Kentucky



Measure 5. Rare Species in Kentucky



Indicator 15. Fish and Mussels

Background Freshwater mussels are the most at risk group of species in the United States and Kentucky. Some 305 species of freshwater mussels are found in the United States, which boasts the greatest diversity of mussels in the world.[1] But 23 percent of these native mussels are now considered rare. The loss of native fish and mussels is linked to water pollution and ecosystem alterations such as channelization and dams. One-third of Kentucky's monitored waterways are impaired by pollution. In 1997-99, 22 percent of the 8,581 miles of waterways assessed for aquatic life could not fully support or partially support the fishable goal. Another growing threat to native mussels is the exotic zebra mussel which can attach to native species and prevent feeding and reproduction. Zebra mussels have been found in several state waterways including the Kentucky River, the Ohio River, Lake Barkley and Kentucky Lake.

Kentucky has a great diversity of mussels, with 103 native species. Only two states, Alabama and Tennessee, have more species of mussels than Kentucky.[2] Thirty-five percent of the state's native mussel species are considered at risk. Threatened and endangered mussels have been found in 58 Kentucky counties. Several species of freshwater fish are also at risk. Of the 237 fish species native to Kentucky, 26 percent are considered rare. Threatened and endangered fish occur in six counties in Kentucky. Among those is the Blackside dace, which was federally-listed as threatened in 1987. This rare, three-inch-long fish is found only in very short segments of 30 creeks in the Cumberland River Basin in Kentucky and Tennessee.

At a Glance

Number of mussel species in Kentucky 103

Number of mussel species at risk 36

Number of fish species in Kentucky 237

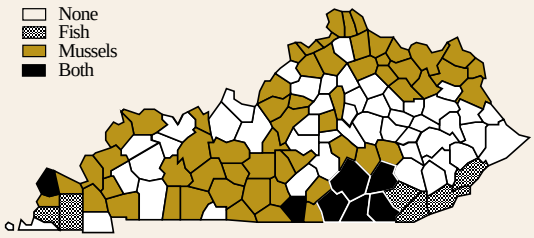
Number of fish species at risk . . . 61

Goal Enhance, restore and protect wildlife diversity and support sustainable use.

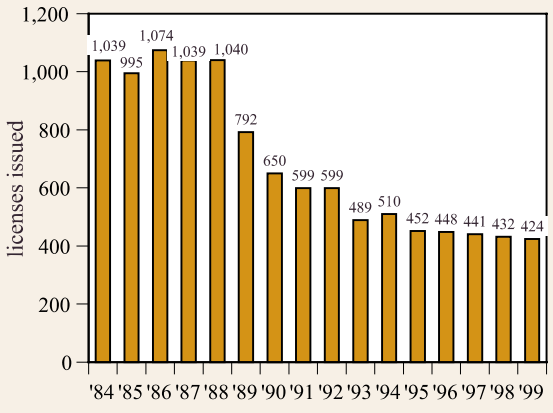
Progress State efforts to protect mussel habitat continue. Eight mussel sanctuaries have been established in the state. Commercial mussel harvesting has also been banned on several waterways including the Cumberland, Green and Barren rivers and in four areas of the Ohio River.

Kentucky's commercial mussels are sustaining viable populations, according to state fish and wildlife officials. However, harvesting of commercial mussels has declined significantly. During 2000, 24,367 pounds of mussels were harvested from lakes and rivers, down from 2,706,731 pounds in 1995. Most mussels harvested in Kentucky are purchased for the cultured pearl industry in Japan. Kentucky mussel shells are used as seeds for cultured pearls. The decline in commercial mussel harvests in Kentucky is directly at-

Measure 1. Federally Threatened and Endangered Fish & Mussels in Kentucky

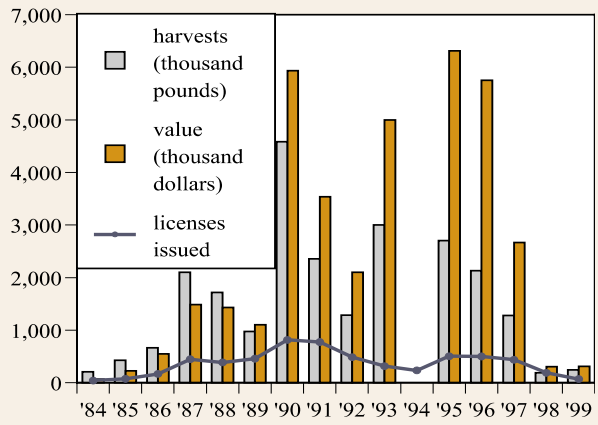


Measure 2. Commercial Fishing License Trends in Kentucky



Fish & Mussels

Measure 3. Commercial Mussel Harvesting Trends in Kentucky



tributed to an epidemic that has killed millions of akoya pearl oysters and slashed production in Japan's pearl culturing areas by 45 percent since 1996. After several years of scientific investigation, the specific cause of the oyster disease remains a mystery.[3] The most prevalent notion is that the culprit is a virus. It is uncertain when and if the akoya pearl industry will recover.

Illegal poaching of mussels remains a problem in Kentucky. Efforts to catch and prosecute violators are ongoing. In 2000, 27 citations were issued by state law enforcement officials for illegal harvesting of mussels.

Pollution is also affecting the state's million dollar commercial fishing industry. For the eighth consecutive year, a fish consumption advisory has been issued along the 664-mile stretch of the Ohio River bordering Kentucky. The Ohio is a major commercial fishing river. Commercial fishing licenses show a declining trend, reaching their lowest level in 15 years in 1999. Commercial fishing is expected to continue to decrease on open bodies of water and increase in aquaculture settings. There are currently 194 aquaculture operations in Kentucky, including growers, producers and pay lakes.[4] Kentuckians consume an estimated 60 million pounds of seafood per year. Less than 4 percent of the seafood consumed in Kentucky is produced in the state.[5]

Footnotes

1. "Freshwater Mussels," by M. Lynne Corn, Congressional Research Service, Publication 94-560 ENR, July 14, 1994.

2. Ibid.

3. What's Killing the Oysters," by Peter Tyson, Nova Online, Web site - http://www.pbs.org/wgbh/nova/pearl/oysters.html, November 2000.

4. Includes live hauling, producers, growers, commercial pay lakes, processors, suppliers and dealers as listed in the Kentucky Aquaculture Directory, Ky. Department of Agriculture, March 2001.

5. Kentucky Aquaculture Association, Web-site - http://www.kentuckyaquaculture.com/page3.html.

Measures - notes and sources

***Measure 1**. Source: Ky. State Nature Preserves Commission.*

***Measure 2**. Source: Ky. Department of Fish and Wildlife Resources.*

***Measure 3**. 1994 harvest and value data not available. Source: Ky. Department of Fish and Wildlife Resources.*

Indicator 16. Rare Birds

Background Kentucky has a rich diversity of birds. Some 350 native species of birds are found in Kentucky (168 of which nest or breed in the state), adding to the state's biological diversity and our quality of life. But 29 percent of the native bird species in Kentucky are considered rare.

The population of birds rises and falls due to a number of complex factors, including weather, pollution, food supply and changes in land use. The Breeding Bird Survey for Kentucky reveals that 25 of the 69 bird species with a statistically valid sample size show a long-term (33-year) decline in populations, while 21 species are increasing and 23 show no significant change.[1]

One of the most significant factors in the decline of many migratory songbird species is habitat loss. For some species, such as the Cerulean warbler, which has declined an average of 5.9 percent annually for the past 30 years, loss and fragmentation of breeding grounds (mature hardwood bottomland forests) and wintering habitat (tropical forests of South America) have contributed to the decline. Some grassland birds, like the Grasshopper sparrow, may also be declining in Kentucky due habitat loss and conversion of grassland to row crops. Approximately 14 percent of the 350 native bird species in Kentucky are considered rare.

At a Glance

Number of native bird species in Kentucky 350

Number of bird species at risk. 49

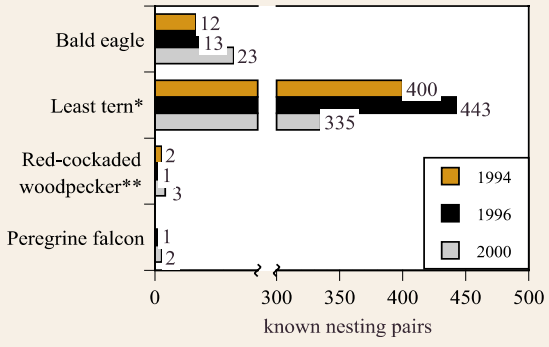
Goal Enhance, restore and protect wildlife diversity and support sustainable use.

Progress Efforts to restore threatened and endangered bird species in Kentucky continue with mixed results. One of the most successful bird recovery efforts to date has been the bald eagle. The banning of the pesticide DDT and laws to protect habitat and prohibit hunting are credited for the comeback of the bald eagle. Nationwide efforts have been so successful that the status of the bald eagle has been upgraded from endangered to threatened.[2] There are now 5,748 nesting pairs of bald eagles nationwide, up from 417 in the 1970s. In Kentucky, there are 23 nesting pairs of bald eagles located in western counties of Ballard, Carlisle, Fulton, Henderson, Hickman, Hopkins, Lyon and Trigg. In 2000, Kentucky also saw the first successful nesting pair of bald eagles in eastern Kentucky.

Another restoration success story is the osprey. Between 1981 and 1991, 133 osprey were released at Land Between the Lakes, Laurel Lake and other sites. Osprey is considered on the road to recovery with 25 active nests in 2000. Efforts are also underway to bring the peregrine falcon back to Kentucky. Between 1993 and 1999, 82 falcons were released in downtown Lexington, at the Kentucky Utilities Ghent Power Plant in Winchester, and at the E.W. Brown Power Plant at Lake Herrington. State fish and wildlife officials plan to release more falcons in 2001 in rural areas along cliff lines with the goal of establishing at least three breeding pairs in the state. A pair of falcons from restoration efforts in nearby states has taken up residence in Louisville and has successfully bred there since 1995. As of 1999, the American peregrine falcon is no longer listed as federally threatened or endangered.

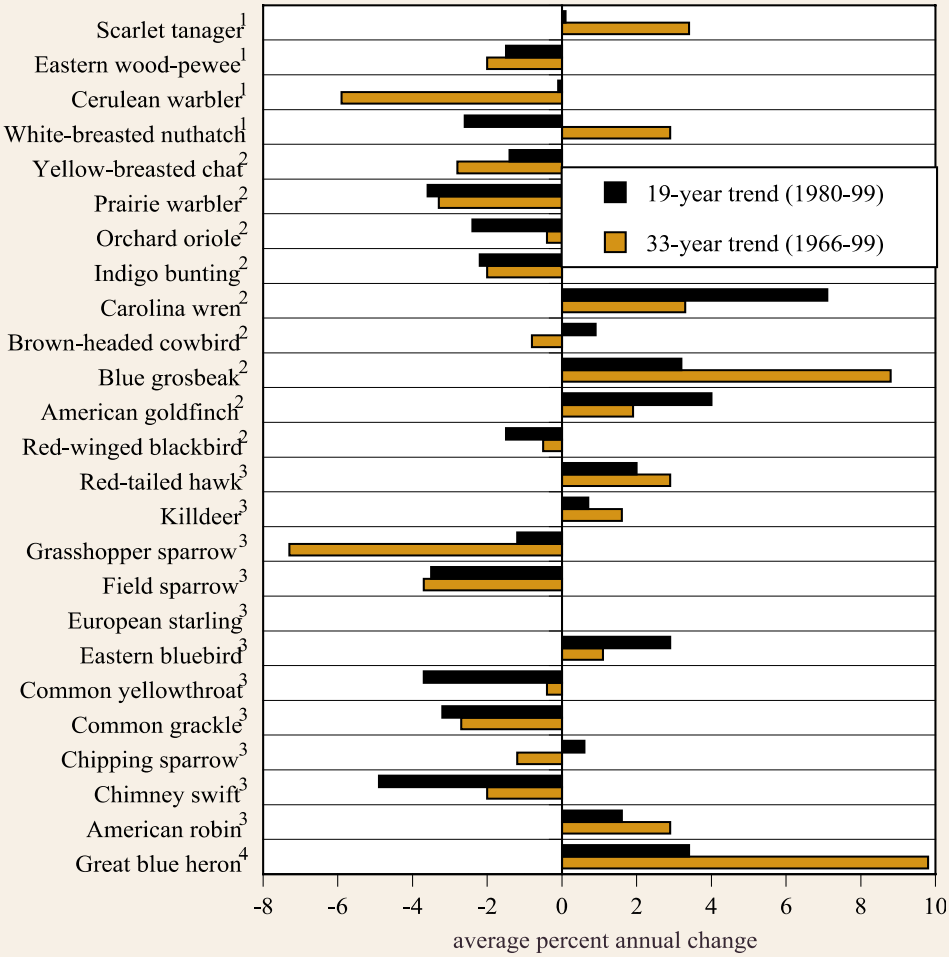
Efforts to restore other bird species in Kentucky have not been as successful. The U.S. Forest Service initiated measures to improve the chances for recovery of the red-cockaded woodpecker with measures to enhance the bird's mature pine-grassland community on the Daniel Boone National Forest. Among the measures used were prescribed fire and the removal of midstory trees. The number of red-cockaded woodpeckers increased to 23 (including 3 nesting pairs), due in large part to a reintroduction program.

Measure 1. Federally Endangered and Threatened Bird Species in Kentucky



Rare Birds

Measure 2. Selective Bird Population Trends in Kentucky



However, extensive damage to roosting trees in the southern Cumberland Plateau by an infestation of southern pine beetles in 1999 and 2000 has forced the U.S. Fish and Wildlife Service to move all red-cockaded woodpeckers from Kentucky to the Sandhills National Wildlife Refuge in South Carolina and the Ouachita National Forest in Arkansas. Plans are being developed to restore lost habitat and return the bird to Kentucky's forests in the future.[3]

Footnotes

***1**. The best overall data on bird population trends in the state are collected as part of the national North American Breeding Bird Survey. While the survey is limited by several factors, including limited sample size for certain species, it still serves as an important tool to identify native bird species at risk.*

***2. "**The Bald Eagle is Back!," U.S. Fish and Wildlife Service, press release 7/2/00. Web site - http://www.fws.gov/r9extaff/eaglejuly2.html.*

***3**. "Federal and State Partners to Rescue Red-cockaded Woodpeckers from Daniel Boone National Forest," U.S. Fish and Wildlife Service, press release, March 7, 2001.*

Measures - notes and sources

***Measure 1**. Species with statistically significant long-term or short-term trends. 1. Woodland habitat. 2. Brush/mixed habitat. 3. Farm/open land habitat. 4. Water/marsh habitat. Source: U.S. Fish and Wildlife Service Breeding Bird Survey, Ky. State Nature Preserves Commission.*

***Measure 2.** Earlier and historic data not available. *Based on site surveys and estimates. Source: Ky. Department of Fish and Wildlife Resources, U.S. Forest Service.*

Indicator 17. Waterfowl and Wetlands

At a Glance

Wetland acreage in Ky.
original. . . . . .1.6 million
current 360,000

Number of resident wild ducks
1970 156,983
1980 50,960
1999. 47,033

Number of resident Canada goose
1993 18,000
1999 46,395

Background Habitat loss is considered one of the greatest threats to native species. Ecological communities that provide habitat to animals and plants have undergone significant change in the past two centuries, affecting populations and the range of a number of native species.[1] Nowhere is the alteration of our natural landscape more apparent than in the loss of wetlands. Historical data shows that at one time more than 220 million acres of wetlands existed in the United States. More than 50 percent of those wetlands have since been destroyed to make way for farms, roads and homes.[2] In Kentucky, 75 percent of the 1.6 million acres of original wetlands have been converted to other uses. Wetland ecosystems provide critical habitat for many species of wildlife and plants including a wide variety of ducks and geese. Waterfowl is considered one of the most prominent and economically important groups of migratory birds of the North American continent. The economic benefits of waterfowl in the United States is estimated to exceed more than $100 billion a year.[3]

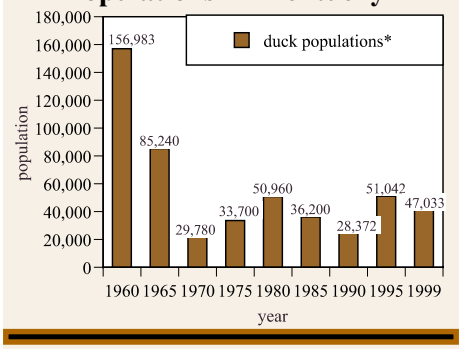
Goal Enhance, restore, and protect wildlife diversity and support sustainable use.

Progress The loss of wetlands can be attributed to a decline in waterfowl populations in Kentucky. But efforts to protect wetlands in Kentucky and important wintering grounds in Canada have helped to stabilize waterfowl populations. In fact, Kentucky has become home to a growing number of resident Canada geese. Flocks of geese were established from releases that occurred in the state during the 1970s and early 1980s. Canada geese populations are now estimated at 46,395.

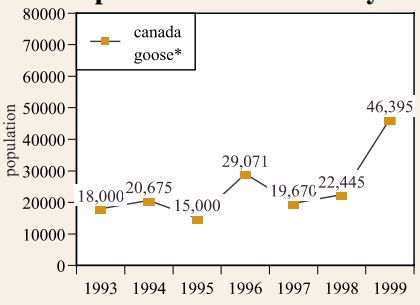
In 1991, a nationwide policy of no net loss of wetlands was adopted to halt the conversion of wetlands to other uses. Federal and state regulations require that for every acre of wetland destroyed, two or more acres must be created. In Kentucky, 1,433 acres of wetlands were converted to other uses, and 3,299 acres were created or restored between 1991 and 2000. While this has resulted in a overall net increase in wetland acreage, the loss in function of a mature wetland versus a newly restored or created one is considerable, according to biologists. It is estimated that it may take 40 years before a wetland is fully functional.

Another national initiative to conserve wetlands is the federal Wetland Reserve Program. Under this program, the federal government compensates farmers who set aside original wetland acreage. Currently, more than 1 million acres of wetlands are enrolled in the program nationwide—7,459 acres of which are in Kentucky.[4] Federal efforts are also underway to purchase 20,000 acres along the East Fork of Clarks River in western Kentucky to create the state's first national wildlife refuge. Clarks River is one of the few remaining unchannelized bottomland hardwood wetland ecosystems in Kentucky and is an important migratory bird flyway. To date, 5,600 acres have been acquired at a cost of $1.5 million.

Measure 1. Wild Duck Populations in Kentucky



Measure 2. Canada Goose Populations in Kentucky



Footnotes

1. Kentucky Alive, Report of the Kentucky Biodiversity Task Force, 1995.
2. "North American Waterfowl Management Plan," U.S. Fish and Wildlife Service, 2000, Web site - http://birdhabitat.fws.gov/NAWMP/nawmphp.htm.
3. Freshwater Ecosystems Services, Sandra Postel and Stephen Carpenter, Island Press. Washington D.C., 1997.
4. "Total WRP Acres Enrolled," U.S. Department of Agriculture, Wetland Reserve Program, March 2001.

Measures - notes and sources

Measure 1. **Based on midwinter five-year averages. Source: Ky. Department of Fish and Wildlife Resources.*
Measure 2. **Resident Geese Population. Source: Ky. Department of Fish and Wildlife Resources.*

Bats & Cave Ecosystems

Indicator 18. Bats and Cave Ecosystems

At a Glance

Number of caves in Kentucky 6,700

Gray bat population
1983. 230,000
1991. 200,000
1999. 225,000

Virginia big-eared bat population
1983 1,200
1991 3,700
1999. 5,100

Indiana bat population
1983 74,000
1991 59,000
1999 31,000

Background One of the most fragile and unique ecosystems in Kentucky is its caves. The number of known Kentucky caves is now estimated at 6,700, and they are found in 87 of Kentucky's 120 counties.[1] The caves of the Pennyroyal and Bluegrass regions represent one of the major concentrations of these unique ecosystems in the United States and world.[2] For example, Mammoth Cave in Edmonson County is the most extensive cave ecosystem in the world, housing 200 species of plants and animals.

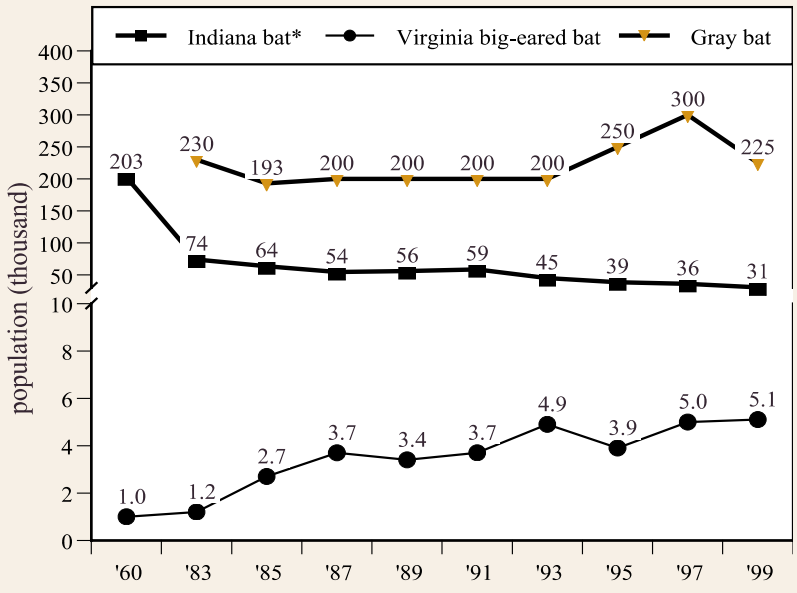
Pollution and other disturbances, however, have altered many caves and impacted populations of many species dependent upon these ecosystems. This is particularly the case for bats. Of the 45 species of bats found in the continental United States, six are federally listed as threatened or endangered under the Endangered Species Act of 1973. Three of these species occur in Kentucky—the Gray bat, the Indiana bat, and the Virginia big-eared bat. The decline in bat populations is linked to the destruction or vandalism of caves, disturbance of hibernating and maternity bat colonies, direct killing of bats and the use of pesticides and other chemical toxicants on the bat's food sources.

Goal Enhance, restore and protect wildlife diversity and support sustainable use.

Progress To date, more than 3,800 caves in Kentucky have been mapped.[3] Many of these caves are home to the state's 16 native species of bats.

Federal and state efforts to gate and protect caves have assisted in protecting bat habitat and helped to restore populations of some species of rare bats. For example, 81 percent of historic gray bat population has been lost in Kentucky.[4] However, nationwide efforts to protect the bat's habitat has resulted in an increase in the gray bat population. Kentucky has also witnessed an increase in the gray bat population, although during the past year populations have declined. It is hoped that gray bat populations will continue to increase in Ken-

Measure 1. Federally Threatened and Endangered Bat Populations in Kentucky



tucky with the gating of the bat's primary hibernation cave and the purchase and management by government agencies of maternity caves in Allen, Adair and Hart counties.

Populations of Virginia big-eared bats are increasing at both the national and state level. The Virginia big-eared bat's national population is estimated at 18,492.[5] Virginia big-eared bat populations in Kentucky have steadily increased since 1989 after the purchase and protection of cave habitats in Lee County by the U.S. Forest Service and the Kentucky chapter of The Nature Conservancy.

The Indiana bat population is about 400,000 nationwide. More than 85 percent of the population hibernate at seven locations—two caves and an underground mine in Missouri, two caves in Indiana and two caves in Kentucky. The nation's Indiana bat population has decreased by more than 34 percent since 1983, while the Kentucky population has dropped by 58 percent.[6] The decline is attributed to commercialization of roosting caves, killing of bats by vandals and human disturbance caused by the growing number of spelunkers.

Footnotes

1. Kentucky Alive, Report of the Kentucky Biodiversity Task Force, 1995.
2. Ibid.
3. Kentucky Geological Survey. Caves and Karst of Kentucky, 1985
4. "Threatened and Endangered Species-Gray Bat," Arkansas Game and Fish Commission, Web site - http://www.agrc.com/threatened/bat-gray.html, and the Ky. Department of Fish and Wildlife Resources.
5. Ky. Department of Fish and Wildlife Resources.
6. Ky. Department of Fish and Wildlife Resources.

Measures - notes and sources

***Measure 1**. *Based on bat populations at three primary caves - Bat Cave (Carter County), Hundred Dome and Dixon Caves (Edmonson County). 1997 populations include estimated loss of 3,000 bats due to floods. Source: Ky. Department of Fish and Wildlife Resources.*

Indicator 19. Game Species

At a Glance

Number of wild turkey in Kentucky
1959 800
1999. 140,000

Number of white tail deer in Kentucky
1940. 2,000
1999. 693,000

Background Some of the most successful wildlife restoration efforts in Kentucky have been for game species of wildlife. For example, in the early part of the 20th century, nearly all deer and wild turkey were eliminated from Kentucky, the result of over hunting and habitat destruction. Since then, these animals have been restored to near-record levels.

Goal Enhance, restore and protect wildlife diversity and support sustainable use.

Progress In 1959, only 800 wild turkeys were known to exist in Kentucky. Since 1978, 6,750 turkeys have been released at 430 sites across the state. By 1999, turkey populations had increased to 140,000. State officials estimate that wild turkey populations will likely peak in the next 10 years at 200,000 to 250,000 birds.

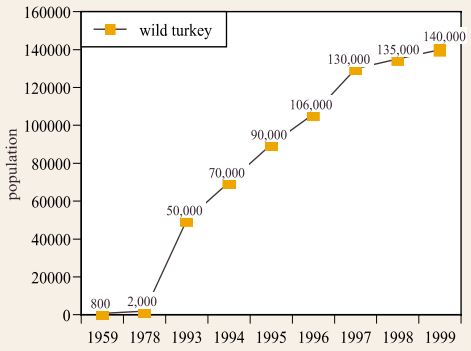
White tail deer populations in Kentucky reached an all-time high in 1999 at 693,000. This is a significant increase since 1940, when unregulated hunting reduced the deer population to 2,000. The distribution of deer ranges from a low of 3.41 deer per square mile in Leslie County to a high of 67.25 deer per square mile in Franklin County. The largest concentrations of deer are in the west central region of the state. State officials estimate that sustainable deer populations could reach as high as 1.7 million; however, the state goal is a population not to exceed 807,000.

The state also monitors populations of three other popular game species—grouse, cottontail rabbit and quail. Long-term trends reveal that populations of quail and rabbit have steadily declined between 1970 and 1980. The decline in the rabbit and quail population is largely attributed to the loss and degradation of habitat. In addition, the planting of tall fescue 31, the dominant vegetation on hay and pastureland, has impacted populations since the grass offers little nutritional or nesting benefits to rabbit and quail. More recent trends, however, reveal an increase in rabbit and quail populations. State wildlife officials have not yet determined why these populations have increased.

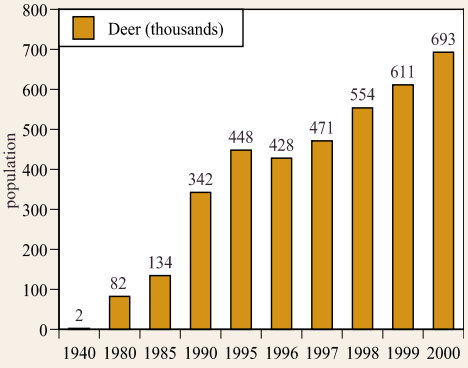
Grouse populations are declining in southern Appalachian states based on long-term monitoring data. Grouse populations have been declining in recent decades due to a loss of habitat. Grouse thrive in young forests, so, given the intensive logging of Kentucky's forests, grouse populations are expected to increase as new forests regenerate.

State efforts to restore elk populations began in 1997. To date, 912 elk have been released in eastern Kentucky. The state population of elk is now estimated to be 1,065. The first modern-day elk hunt in Kentucky will be held in 2001 near Hazard.

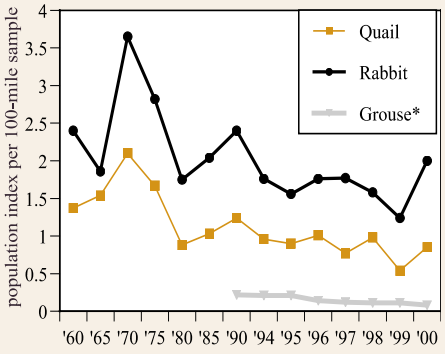
Measure 1. Wild Turkey Populations in Kentucky



Measure 2. White Tail Deer Populations in Kentucky



Measure 3. Quail, Rabbit and Grouse Populations in Kentucky



Measures - notes and sources

Measure 1. *Source: Ky. Department of Fish and Wildlife Resources.*

Measure 2. *Source: Ky. Department of Fish and Wildlife Resources.*

Measure 3. **Field surveys at grouse drumming route listening posts. Source: Ky. Department of Fish and Wildlife Resources.*

Indicator 20. Protection of Natural Areas

Background Kentucky's beautiful landscape and wealth of wildlife are among the most varied in the eastern United States.[1] Today, only scattered remnants of undisturbed natural landscape remain as testimony to our natural heritage. For the past 25 years, the Kentucky Nature Preserves Commission has been inventorying the state for natural areas. The information collected is essential to understanding the state's biodiversity and identifying opportunities to balance conservation with human needs. Inventories have been completed in 27 counties and are underway in 38 counties.

An estimated 1,526,985 acres of land, about 6 percent of the total state acreage, are in public ownership.[2] But the level of protection of these lands varies. For example, only 107,996 acres of these lands (0.4 percent of the state's acreage) are considered fully protected. These include 40 state nature preserves, federal wilderness areas, national parks, conservation organization-owned land and land owned by private nonprofit organizations. Other public lands in Kentucky are identified as managed but not necessarily protected from human disturbance. These include 33 state wildlife management areas, university lands, state parks and most of the 695,000 acres of the Daniel Boone National Forest.

At a Glance

Acres of land in Kentucky . . .25,469,094

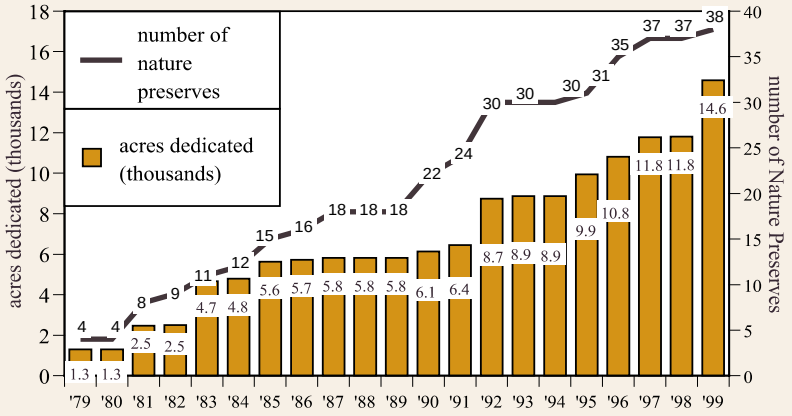
Land under public ownership (acres)
managed 1,526,985
fully protected 107,996

Goal To purchase and protect selected natural areas of the Commonwealth; to protect rare and endangered species and migratory birds; to save threatened areas of natural importance; and to provide natural areas for public use, outdoor recreation and education.

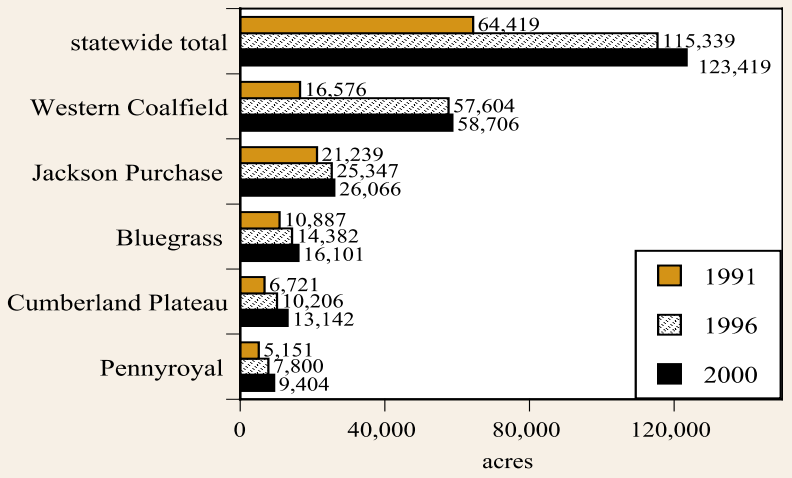
Progress Kentucky has primarily relied on the generosity of its citizens and periodic funds from the state and the federal government to protect important natural areas. The only funding source for many years was donations made to the Kentucky Income Tax Checkoff Program, Nature and Wildlife Fund.

In recent years, Kentucky has made great strides to improve the protection of natural areas. The Kentucky Heritage Land Conservation Fund was created in 1990 and funded in 1994 to provide a permanent source of monies to purchase natural areas from willing sellers. The fund is financed by revenues from the state portion of the unmined minerals tax, environmental fines, the sale of nature license plates and interest earned on undistributed funds. The sale of 18,243 nature license plates has generated $1,902,232 since 1995 and has become one of the most popular specialty license plates in the state. The yearly fluctuations

Measure 1. Kentucky Nature Preserves

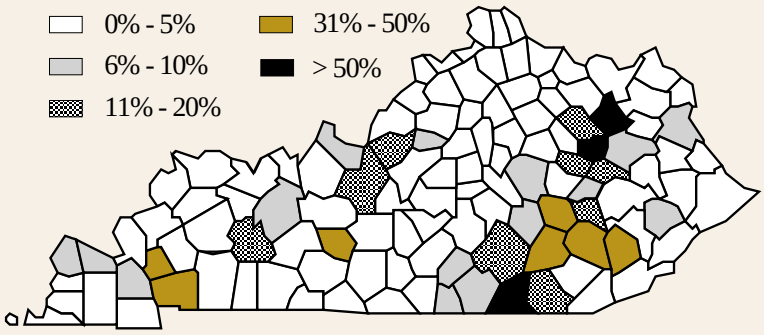


Measure 2. Kentucky Wildlife Management Areas

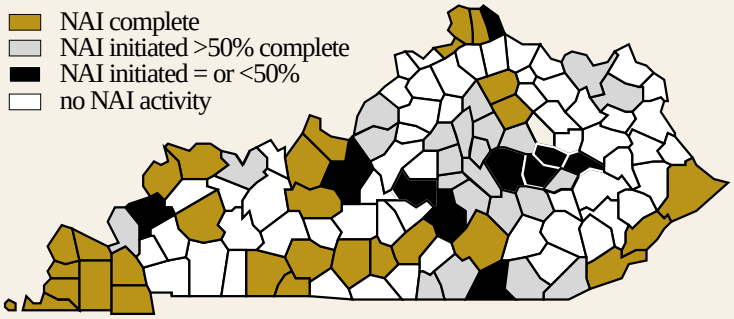


Natural Areas

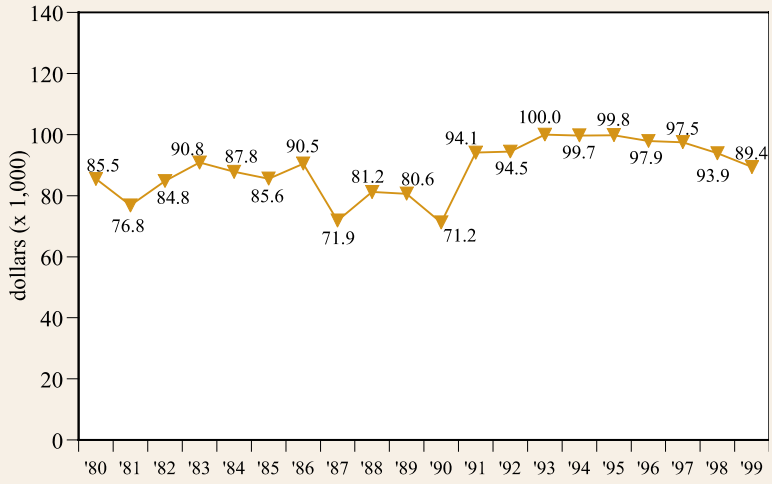
Measure 3. Percent Land Area in Public Ownership (2000)



Measure 4. Status of the Natural Areas Inventory (2000)



Measure 5. Donations to Kentucky Income Tax Wildlife Checkoff Program



of the Heritage Land Conservation Fund are attributed to a backlog in the collection of the unmined minerals tax. Since 1995, the program has funded 37 projects to protect 9,200 acres in 43 counties at a cost of $7.6 million.

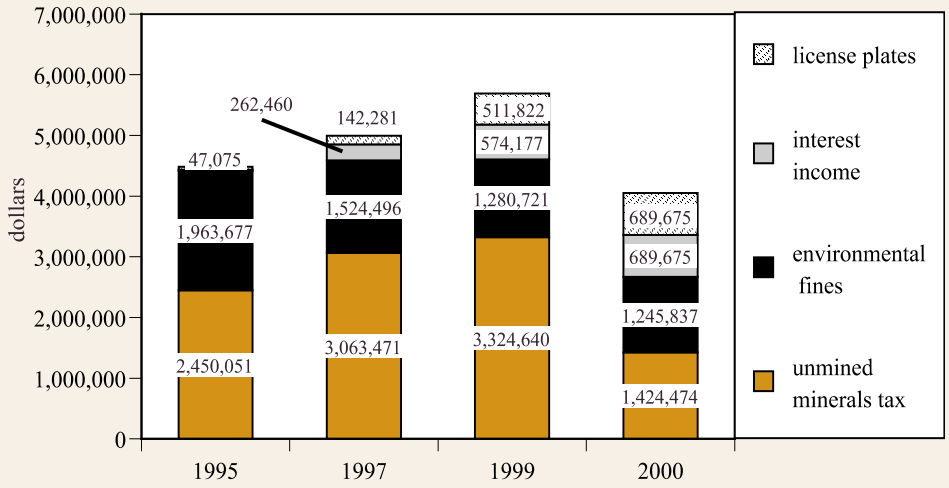
Private landowners are also working to protect natural areas. The Kentucky State Nature Preserves Commission administers the Kentucky Natural Areas Registry to recognize owners of outstanding natural areas for their commitment to preserving Kentucky's natural heritage. The program is a voluntary nonbinding agreement that encourages landowners to continue their stewardship. Forty-five landowners have registered 44 sites totaling 4,367 acres. The Kentucky Department of Fish and Wildlife Resources also works with numerous private companies and landowners to manage wildlife on their land.

The protection of Black Mountain has stood out as one of the most important initiatives in recent years to conserve our natural resources. The mountain is located in southeastern Kentucky in Harlan County and, at 4,145 feet, is the tallest peak in the state. It is also one of the most ecologically diverse place, with 54 different species of animal and plant life. In 2000, the state agreed to purchase the mineral and timber rights at the top elevation of the mountain (above 3,800 feet) from private parties at a cost of $4.2 million. The historic agreement will ensure the mountain is protected for future generations of Kentuckians.

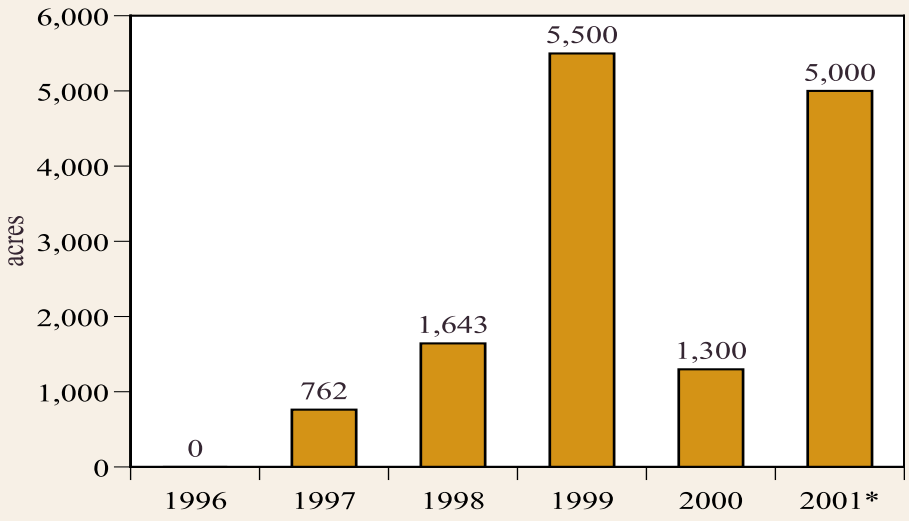
Footnotes

1. Kentucky Alive, Report of the Kentucky Biodiversity Task Force, 1995.
2. Ky. Department of Fish and Wildlife Resources, 2000.

Measure 6. Kentucky Heritage Land Conservation Fund



Measure 7. Kentucky Heritage Land Conservation Purchases

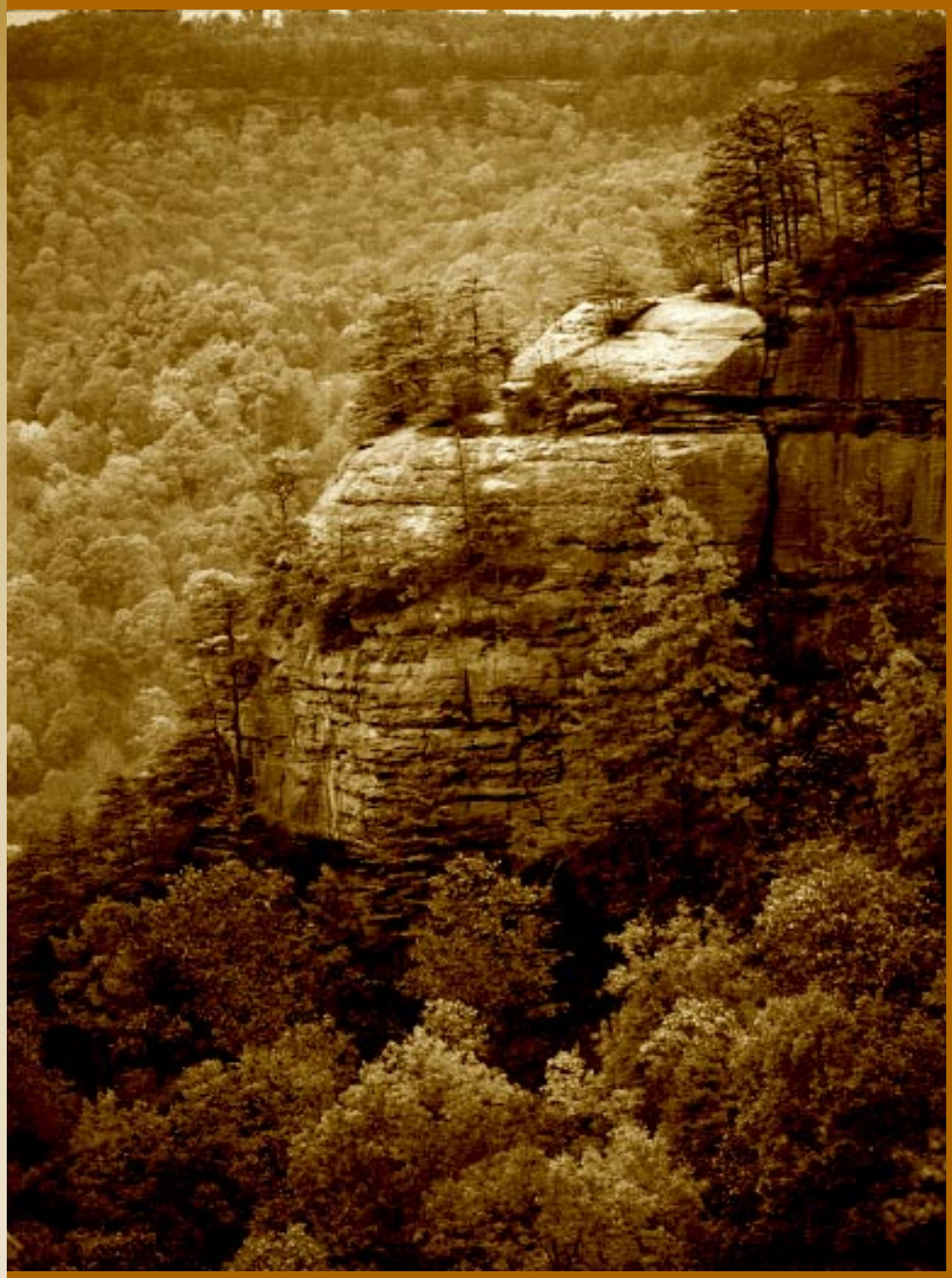


Measures - notes and sources

Measure 1. *Source: Ky. State Nature Preserves Commission.*
Measure 2. *Source: Ky. Department of Fish and Wildlife Resources.*
Measure 3. *Source: Ky. Department of Fish and Wildlife Resources.*
Measure 4. *Source: Ky. Nature Preserves Commission.*
Measure 6. *Source: Ky. Heritage Land Conservation Fund Board.*
Measure 7. **As of May, 2001. Source: Ky. Heritage Land Conservation Fund Board.*

Chapter 7

Resource Extraction



RESOURCE EXTRACTION

COAL PRODUCTION

Indicator 1. Coal Production and Consumption

Background Kentucky's coal resources not only help to meet national and state energy needs, they also contribute to state and local economies. During 1999, the market value of coal mined in the state was approximately $32.4 billion. That year the coal industry employed 17,264, earning $749 million in wages.[1]

Since 1790, 8.1 billion tons of coal have been mined in Kentucky.[2] The Kentucky Geologic Survey (KGS) estimates that there are 95 billion short tons of coal reserves remaining in the state.[3] KGS estimates that less than 50 percent of this total is recoverable given current mining methods and land use restrictions.[4] However, the Energy Information Administration estimates that there are 32 billion short tons of coal reserves in Kentucky. The Energy Information Administration estimates 28.6 billion short tons would actually be mineable.[5]

Coal has been mined in Kentucky during the past 200 years and is found in two regions of the state—the Eastern Kentucky Coalfield and the Western Kentucky Coalfield. In 1999, 79 percent of the coal extracted in the state was mined in the Eastern Kentucky Coalfield. This coalfield contains 45 mineable beds.[6] The average heat content of the coal is about 13,000 Btu per pound with a sulfur content of 1 to 2 percent.[7] In the Western Kentucky Coalfield, there are 10 mineable coalbeds. The heat content is slightly lower than in the eastern field and the sulfur content is higher at about 3 to 4 percent.[8]

At a Glance

Coal mined (tons)
total to date 8.1 billion
1999 . . . . . 144 million

Remaining coal reserves (tons)
total . . . . .32-95 billion
mineable . . 28-47 billion

Coal mined by region (tons) (2000)
East Ky. . . . .105 million
West Ky. . . . 27 million

The Eastern Kentucky Coalfield has become the state's primary source of coal production. Four counties (Pike, Knott, Martin, Perry) accounted for 40 percent of the coal mined in Kentucky in 1999 (144 million short tons). Pike County remains the leading coal producer in the state with 35.7 million tons mined in 1999 (25 percent of the coal output in the state).

Goal Foster the conservation and efficient recovery of coal resources while protecting health, safety and the environment.

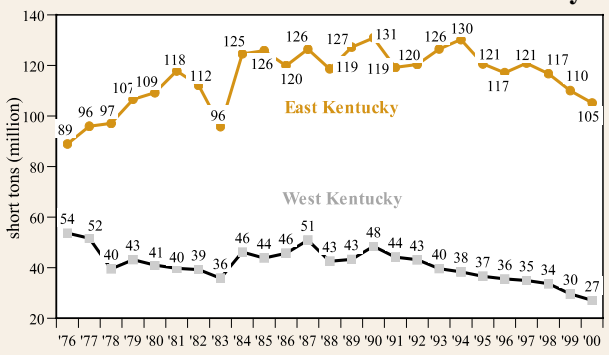
Progress Nationwide coal production increased 23 percent between 1986 to 1999.[9] In Kentucky, long-term coal production trends have remained fairly constant since 1984. However, during the past year, trends reveal an 8 percent drop in coal production levels in the state. Statewide coal production has declined primarily in response to competition from Western states, where the coal is easier and less costly to mine, lower in sulfur content and more plentiful.

Trends reveal a 35 percent decline in coal mined in western Kentucky between 1990 and 1999. This is because western Kentucky coal is higher in sulfur content, making it less desirable to power plants that are working to reduce sulfur dioxide emissions as required under the Clean Air Act Amendments of 1990. Kentucky coal, however, is expected to remain strong in the marketplace due to its high Btu heat content,

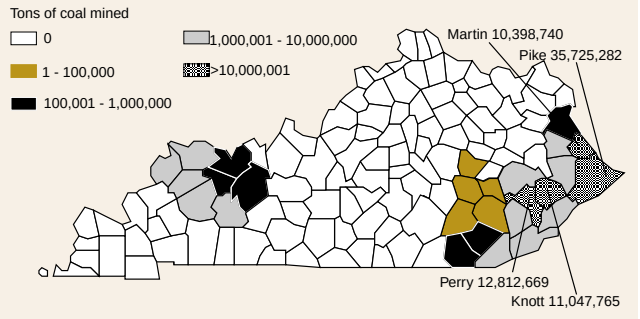
Measure 3. Top 10 Coal Producing States

State	Million short tons 1996	1999
WY	278	334
WV	170	156
KY	159	144
PA	68	76
TX	55	53
MT	38	41
IL	47	40
IN	30	34
ND	30	30
NM	24	30

Measure 1. Coal Production in Kentucky



Measure 2. Coal Production in Kentucky (1999)



Coal Production

relatively low price and increasing demand brought on by higher natural gas prices due to deregulation. Coal energy consumption levels at the national level increased 16 percent between 1984 and 1998. In Kentucky, coal consumption has far exceeded the national average and increased 34 percent between 1984 and 1999, primarily in response to economic growth and increasing demand for electricity.

The majority of the coal produced in Kentucky is consumed by coal-fired power plants. Kentucky power plants reported consuming 34.46 million short tons of coal in 1999, according to the Kentucky Division for Air Quality. Coal fuels 95 percent of all electric power generated in the state.[10] In 1998, the average price paid for Kentucky coal by power plants was $24.52 per short ton compared to the national average of $25.64. That year, Kentuckians paid $.056 per kilowatt-hour for electricity—the third-lowest rate in the country. But cold winters and skyrocketing natural gas prices combined with growing energy demand have led to recent price hikes for coal. Industry leaders reported in January 2001 that some spot-market coal prices had jumped from $18 per ton six months ago to between $48 and $55 a ton. A weekly price survey in the Jan. 29, 2001, edition of the trade publication *Coal Outlook* showed high-quality spot-market coal loaded at the Big Sandy River docks bringing an average of $37 a ton. Coal production is expected to increase in Kentucky due to rising prices and increased demand.

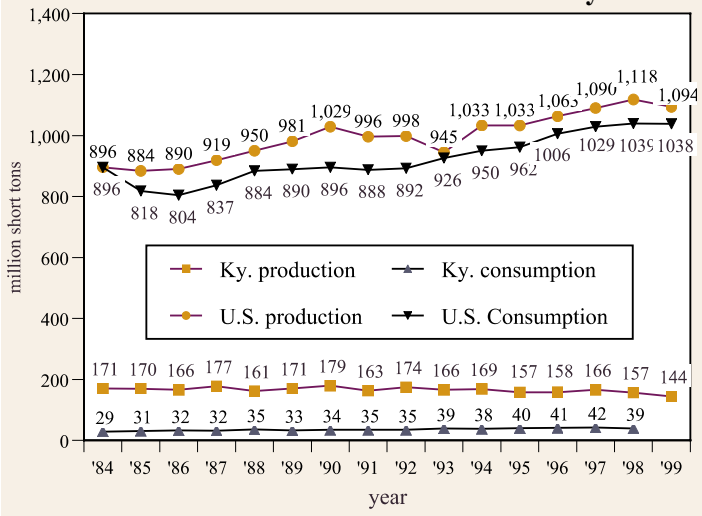
Measure 4. Coal Reserve Base Top 10 Producing States 1997

State	million short tons
WY	67,814
WV	35,397
KY	**32,040**
PA	28,646
TX	12,931
MT	119,676
IL	105,069
IN	9,916
ND	9,395
NM	12,483
U.S.	**507,739**

Measure 5. Price of Coal Delivered to Electric Utilities in 1999

State	Average $
ND	$9.60
MT	$12.23
WY	$13.48
TX	$18.26
IN	$23.59
NM	$24.49
KY	**$24.52**
IL	$28.15
WV	$29.35
PA	$33.00
U.S.	**$25.64**

Measure 6. Coal Production/Consumption in the United States and Kentucky



Footnotes

1. Coal Industry Annual, 1999, U.S. Energy Information Adm.
2. Coal Occurrence in Kentucky, Ky. Geological Survey, Web site - http://www.uky.edu/KGS/coal/webcoal/pages/coaloccurrences.html.
3. U.S. Coal Profile: Kentucky 1997, U.S. Energy Information Adm.
4. Ibid.
5. Kentucky Coal Production 1790-1999, Ky. Geological Survey, Web site - http://128.163.49.71/pub/web/wrs/KYCOAL99.htm.
6. Available Coal Resources in Eastern and Western Kentucky, Ky. Geological Survey, Web site - http://www.uky.edu/KGS/coal/webcoal/pages/coal/availab.htm, September 2000.
7. Coal Occurrence in Kentucky, Ky. Geological Survey, Web site - http://www.uky.edu/KGS/coal/webcoal/pages/coaloccurrences.html
8. Demonstrated Reserve Base of Coal by State, Table 8, Energy Information Administration, 1997.
9. Kentucky Coal Facts 1999-2000, page 5, Kentucky Coal Association, December 1999.
10. U.S. Energy Information Administration, Web site - http://www.eia.doe.gov/cneaf/electricity/st_profiles/kentucky/ky.html.

Measures - notes and sources

Measure 1. *Source: U.S. Energy Information Adm.*
Measure 2. *Source: Ky. Department of Mines and Minerals.*
Measure 3. *Source: U.S. Energy Information Adm.*
Measure 4. *Demonstrated reserve base. 1997 most recent data available. Includes anthracite, bituminous, subbituminous and lignite coal. Source: U.S. Energy Information Adm.*
Measure 5. *Source: U.S. Energy Information Adm.*
Measure 6. *Does not include consumption by independent power producers. Source: Ky. Geological Survey, U.S. Energy Information Adm., Ky. Department of Mines and Minerals.*

Indicator 2. Coal Mines and Mining Methods in Kentucky

Background Between 1978 and 1999, an estimated 1.18 million acres, or 5 percent of the state's 25.8 million acres of land, were permitted for coal mining.[1] It should be noted that not all surface acreage permitted for coal mines is actually disturbed. For example, acreage overlaying underground mines must be included in permits but most underground mines actually disturb very little surface acreage. Historical data is not available to determine the total acreage of land actually disturbed by coal mining. In 1999, there were 583 active coal mines in Kentucky.[2] Those permits covered 40,000 acres of land. A majority of this acreage, 98 percent, was in Eastern Kentucky.

The mining of coal in Kentucky has changed over the past century as new technologies have been developed and federal and state laws governing its removal have been enacted. Coal mines in Kentucky, which once numbered in the thousands, have declined to fewer but larger operations. Surface mining, once widely used in Kentucky during the 1970s and 80s, began to decline as large tracts of high quality surface reserves diminished. Underground mines have now become the principal method used in Kentucky to extract coal.

Goal Foster the conservation and efficient recovery of coal resources while protecting health, safety and the environment.

At a Glance

Acres of land permitted for coal mining to date. . . . . 1.8 million

Number of coal mines
1990 987
1995 598
1999 583

Mining methods (tons) (1999)
surface . . . . . 55 million
underground . . 89 million

Progress The number of Kentucky coal mines fell from 1,858 in 1985 to 682 in 1999, 583 of which are active operations.[3] The drop is attributed to several factors including the repeal of the state's two-acre mine exemption in 1987 and a shift from small independent coal companies to large diversified firms. Many small firms left the industry or merged as coal prices fell and companies could not recover their costs.

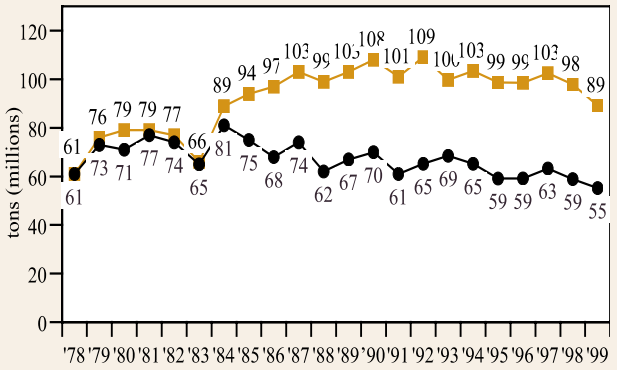
Coal production per mine has more than tripled since 1985 and now averages 304,000 short tons per year. The state's largest mine, Baker, owned by Lodestar Energy Inc., produced 4.48 million short tons of coal during 1999.

Acreage permitted for coal mining continues to decline. For example, between 1995 and 1999, the number of acres permitted for coal mining fell 40 percent, from 67,000 acres to 40,000 acres. The number of acres disturbed by coal mining in Kentucky (being mined or in some stage of reclamation) has averaged 260,000 acres per year over the past several years.[4]

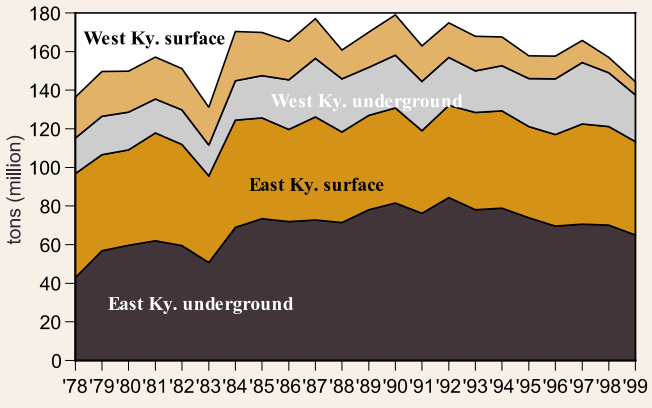
Nearly 62 percent of the 144 million tons of coal mined in Kentucky during 1999 used underground mining methods. In eastern Kentucky, 57 percent of the coal was extracted using underground mining methods. In western Kentucky, 78 percent of the coal mined used underground mining methods.

One particular type of coal mining method—mountain top removal—has recently come to the forefront of public attention because of a recent proposal to mine Black Mountain, the state's highest peak. The mineral rights to the mountain have since been purchased by

Measure 1. Coal Mining Methods in Kentucky

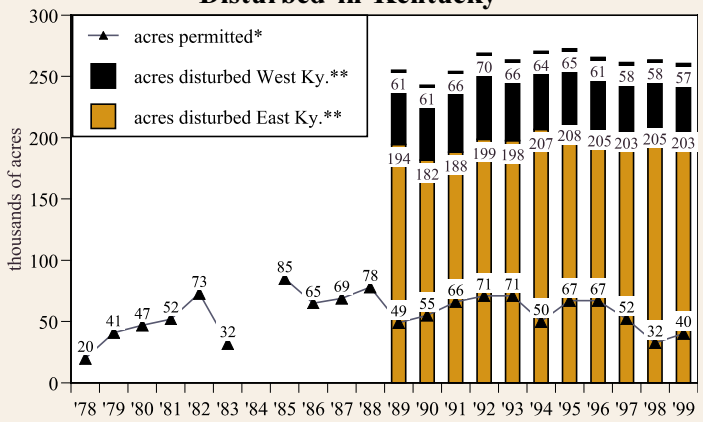


Measure 2. Coal Mining Methods in Kentucky by Region

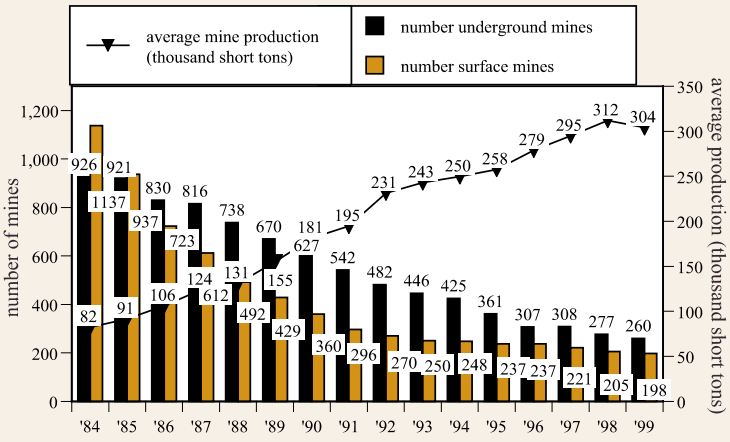


Coal Mines

Measure 3. Coal Mine Acres Permitted and Disturbed in Kentucky



Measure 4. Coal Mines and Average Production in Kentucky



Measure 5. Top 10 Producing Mines in Kentucky (1999)

Company	Mine	County	Tonnage
Lodestar Energy Inc	Baker	Webster	4,448,451
Webster County Coal	Dotiki	Webster	4,223,401
Peabody Coal Co.	Camp 11	Union	3,711,043
Peabody Coal Co.	Camp 1	Union	3,003,835
Roberts Bros Coal	Cardinal 2	Hopkins	1,877,372
Kenamerican Resources	Paradise 9	Muhlenberg	1,838,058
Addington Mining	# 4	Martin	1,749,898
Shamrock Coal Co. Inc.	18-19 (46)	Leslie	1,737,874
Addington Mining Inc.	0218-w	Breathitt	1,588,572
Bledsoe Coal Corp.	#4 (1)	Leslie	1,512,295
Total top 10			**24,329,626**
Total state			**139,626,000**

the state. Mountaintop operations are those mines that remove all or a large portion of a coal seam or seams running through the upper fraction of a mountain or ridge. The mine spoil is often disposed in adjacent mountain valleys. Since 1982, the state has issued 395 permits for mountaintop removal operations in Eastern Kentucky.[5] Mountaintop mining represents 10 to 15 percent of Kentucky's coal industry, according to the Kentucky Coal Association.[6]

The use of mountaintop mining has come under public scrutiny after a lawsuit was filed in West Virginia claiming the practice was impairing water quality and did not meet the requirements of the federal Clean Water Act. In October 1999, a federal judge ruled that mountaintop removal and the use of valley fills for the disposal of spoil violated both the Clean Water Act and federal coal law.[7] Recently, however, a federal appeals court overturned the ruling indicating that it should have been heard in a state court. The ruling will be appealed, according to the West Virginia Highlands Conservancy, the group that filed the lawsuit.[8] The federal Office of Surface Mining (OSM), has indicated that mountaintop operations raise a number of other complex issues that are partially or wholly outside the confines of federal mining laws. These are currently under study by OSM and other federal agencies.

One of the controversial aspects of mountaintop mining is the use of valley fills. Valley fills are earth and rock structures designed and constructed for the permanent depositing of excess rock and dirt from mining operations. This deposited material is known as a valley fill. These fills can encroach upon stream segments. It is estimated that more than 900 miles of intermittent and perennial streams have been buried by valley fills in Appalachia.[9] In Kentucky, valley fills have impacted approximately 300 miles of streams during the past two decades.[10] A task force is currently considering how

federal agencies can better coordinate various issues associated with valley fills and mountaintop mining practices. The Kentucky Department of Surface Mining has been working to minimize the size of valley fills and has also eliminated the practice of "wing dumping," the dumping rock and dirt from the top of the mountain into nearby streams and valleys. The department is also reviewing existing permits to determine if the post-mining land use for mountaintop removal operations and valley fills were properly issued and in compliance with state rules.[11]

Footnotes

1. Ky. Department for Surface Mining Reclamation and Enforcement, December 2000.
2. 1999 Annual Report, Ky. Department of Mines and Minerals.
3. 1999 Annual Report, Ky. Department of Mines and Minerals.
4. Ky. Department for Surface Mining Reclamation and Enforcement, December 2000.
5. Ky. Department for Surface Mining Reclamation and Enforcement, March 2001.
6. "Mountaintop-mining decision overturned, by Brian Farkas, Associated Press, April 25, 2001.
7. "Mining the Mountains," The Charleston Gazette On-line, October 21, 1999.
8. "Mountaintop-mining decision overturned, by Brian Farkas, Associated Press, April 25, 2001.
9. Remarks of W. Michael McCabe, EPA Regional Administrator, Public Hearing on Valley Fills/Mountaintop Removal, Logan, West Virginia, Oct. 24, 1998, Web site - http://www.epa.gov/region3/r3oped/oped99-37.htm.
10. This number has been generated by the Ky. Department of Surface Mining Reclamation and Enforcement by measuring the blue-line streams identified on U.S. Geological topographic maps. There may be significant discrepancies on these maps and the number may be significantly overstated, but it is currently the only tool available to make such a determination, according to the Ky. Department of Surface Mining Reclamation and Enforcement.
11. Ky. Department for Surface Mining Reclamation and Enforcement, December 2000.

Measures - notes and sources

***Measure 1**. *Includes strip, auger, and auger/strip. Source: Ky. Department of Mines and Minerals.*
***Measure 2**. Surface mining is primarily the use of mountain top and contour mining in east Kentucky and area mining in west Kentucky. Underground mining is primarily the use of room and pillar, long wall, and drift mining techniques. Auger mining is used in east Kentucky and extracts coal from underneath the remaining mountain or hill top. Source: KY Department of Mines and Minerals.*
***Measure 3**. *Acres only reflect those permitted acres brought under permit during those calendar years. Does not include acreage added under permit revisions or amendments. 1984 acreage not shown (517,000 acres repermitted in 1984 as a result of transition from interim to permanent program which also includes acreage permitted for the first time that overlays underground mine workings). **Acreage disturbed by permitted mines either actively mining or in some stage of reclamation as of December 30 for each year provided. Earlier data not available. Source: Ky. Department for Surface Mining Reclamation and Enforcement.*
***Measure 4**. Source: U.S. Energy Information Administration.*
***Measure 5**. Source: U.S. Energy Information Administration.*

Indicator 3. Coal Production Waste

At a Glance

Number of coal slurry impoundments
U.S. 653
Kentucky 88

Kentucky coal slurry impoundments
investigated. 70
with problems 9

Background The mining of coal creates a significant amount of waste. Before passage of the federal Surface Mining Law in 1977, it was a common practice in steep-sloped areas of Appalachia to dispose of excess spoil by pushing it down the mountain.[1] Under the Surface Mining Law, excess spoil is required to be permanently stored in engineered spoil fills.

The cleaning of coal also creates waste. Run-of-the-mine coals are washed in water to remove non-combustible mineral matter from coal. The costs of cleaning fine coal particles are substantially higher than those for cleaning coarse coal.[2] Therefore, many companies discard them along with water to fine coal impoundments. In general, 5 to 10 percent of the coal mined in the eastern United States is too fine to be cleaned efficiently, and perhaps more than one half of it is being discarded.[3] According to a recent survey conducted by U.S. Department of Energy, approximately 2.5 to 3 billion tons of fine coal has been deposited in impoundments.[4] Coal impoundments typically have a life of up to 20 years and are several acres in size. All impoundments must be drained and reclaimed prior to the release of a coal mine bond.

The issue of coal slurry impoundments rose to public attention after the failure of an impoundment near Inez, Ky. on Oct. 11, 2000. An estimated 250 million gallons of coal slurry and water broke through the 72-acre impoundment into underground mines works at a coal preparation plant owned by Martin County Coal Corp., a subsidiary of A.T. Massey Coal Co. Inc. The slurry/water mixture flowed into Coldwater Fork and Wolf Creek before making its way into Tug Fork, a tributary of the Big Sandy River. The spill impaired an estimated 60 miles of waterways along the Kentucky and West Virginia border. Gov. Paul Patton declared a state of emergency in 10 eastern Kentucky counties affected by the spill. The spill closed schools and businesses and disrupted drinking water service to hundreds of people. The company has been cited for violating Clean Water Act rules. Martin County Coal is in the process of cleaning up the spill.

Measure 1. High-Risk Coal Impoundments in Kentucky

Impoundment	County	Coal Company
Little Camp Branch	Bell	CC Coal
Butler Branch	Floyd	Bull Creek Coal
Left Fork,Turtle	Harlan	New Horizons Coal
Louder Creek	Harlan	Jericol Mining
Beartree Branch	Harlan	Manalapan Mining
Turkeypen Branch	Harlan	Harlan Cumberland
Right Fork, Turtle	Harlan	New Horizons
Left Fork, Wendover	Leslie	Leslie Resources Inc.
Clay Hollow	Letcher	Cook & Sons Mining
Holty Branch	Martin	Peter Cave Mining
Slurry Cells D1, D2	Martin	17 West Mining
River Queen	Muhlenberg	Peabody Coal
Saddle Fork	Perry	Leeco
Harris Branch	Perry	Buckhorn
Lick Fork	Perry	Leeco
Long Fork	Pike	Long Fork Coal
Bear Hollow	Pike	Sunny Ridge Mining
Enterprise	Pike	Premier Elkhorn Coal
Rob Fork	Pike	Branham & Baker
New Ridge	Pike	Sidney Coal

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

Progress Nationwide, there are an estimated 653 coal slurry impoundments.[5] In Kentucky, there are 88 coal slurry impoundments. The U.S. Mine Safety and Health Administration has ranked 20 impoundments in Kentucky as high risk for breakthrough potential, nine as moderate risk and the remainder as low risk.[6] An impoundment being ranked as a high or moderate risk does not necessarily mean that a fail-

ure is expected, but that greater attention and study needs to be paid to the safety of the impoundment.

The Martin County coal spill is under investigation by state and federal officials. In the meantime, state surface mining officials are conducting a review of Kentucky's 88 slurry impoundments. As of March 2000, 70 sites have been investigated. Of these, nine required changes in design to prevent failure and two were cited for not following the approved plans.

Alternatives to coal slurry impoundments are also under review. Two million dollars has been allocated by Congress to assess alternative options and improve methods for storing coal slurry waste. As of May 21, 2001, there were 16 applications pending in Kentucky to modify or build new coal slurry impoundments.

Footnotes

1. *National Energy Policy: Coal, Subcommittee on Energy and Air Quality hearing, U.S. Congress, presentation by Dr. Roe-Hoan Yoon, Director, Virginia Center for Coal and Minerals Processing, Virginia Tech, March 14, 2001, Web site - http://www.house.gov/commerce/hearings/03142001-94/Yoon128.htm.*

2. *Ibid.*

3. *Ibid.*

4. *Ibid.*

5. *Coal Waste Dams and Impoundments, U.S. Mine Saftey and Health Administration, Web site - http://www.msha.gov/impoundments/impoundmenthp.htm.*

6. *Ibid.*

Measures - notes and sources

Measure 1. *Source: U.S. Mine Safety and Health Administration.*

Reclamation of Coal Mines

Indicator 4. Reclamation of Coal Mines

At a Glance

Acres of permitted coal minelands reclaimed total to date . . .612,000
1999 20,000

Background Reclamation is a standard and integral part of coal mining operations. A coal operator must post a performance bond (ranging as high as $10,000 per acre) sufficient to cover the cost of restoring the site to assure reclamation.[1] This must be done before a permit can be granted. The bond is not fully released until the final revegetation of the site has been determined to be successful – this time period could be up to 10 years following reclamation. Nationwide, an estimated 2.5 million acres of coal mined lands have been reclaimed.[2]

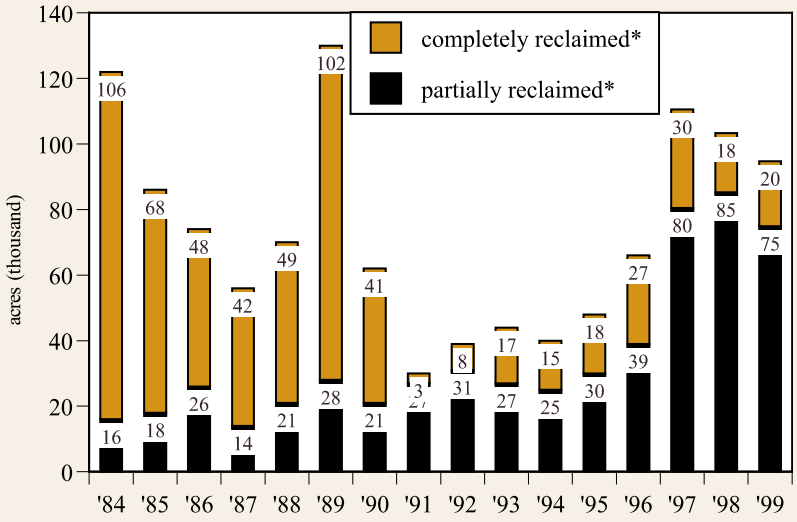
Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

Progress Since 1984, 612,000 acres of permitted mine lands have been reclaimed in Kentucky. There has been an increase in partially reclaimed lands in Kentucky during recent years as more coal mines close and reclamation takes place.

While data are not available for the state to determine the extent of what land uses mine lands have been reclaimed to (agriculture, development site, forestland), state surface mining officials report that about half of the mine lands in Kentucky are reclaimed to hay and pastureland at the request of the landowner. Coal companies prefer to reclaim with grasses because it is easier to establish a ground cover in order to meet coal mine bond release requirements.

Efforts to promote forests as a post-mine reclamation land use became a state priority in 1996 after the Environmental Quality Commission found that current grading practices discouraged the use of trees as a reclamation option due to excessive soil compaction and other requirements. In response, the Natural Resources and Environmental Protection Cabinet established a work group to review current reclamation practices that impact tree survival and develop guidance that would promote trees on mined lands. On March 10, 1997, the Kentucky Department of Surface Mining issued a Reclamation Advisory Memorandum (RAM) #124 to promote reforestation of mine lands. The emphasis of this initiative has been to support the establishment of high-value hardwood forests (oaks, walnuts, poplars and ash) that would

Measure 1. Coal Mine Acres Reclaimed in Kentucky



provide a long-term renewable resource for the coalfield residents. State surface mining officials have been working closely with the University of Kentucky on the development and construction of approximately 100 acres of reforestation test plots. The ongoing field studies indicate that surface mined lands are very capable of supporting high-value forests if properly reclaimed, usually by limiting excessive compaction. The Kentucky Natural Resources and Protection Cabinet recently received a $2 million grant from OSM to promote the reforestation of hundreds of acres mine lands.

Since issuance of RAM #124, there has been an increase of approximately 15 percent in the number of surface mining applications that propose a postmining land use that requires the planting of trees and shrubs. Due to the success of Kentucky's "Reforestation Initiative," several other states (West Virginia, Virginia, Ohio, Tennessee) have begun their own reforestation initiatives and the federal Office of Surface Mining has started a federal initiative of its own.

Footnotes

***1**. Reclamation Success, Coal Mining Reclamation, Mineral Information Institute, Web site-http://www.mii.org/coal/coal.html.*
***2**. Ibid.*

Measures - notes and sources

***Measure 1**. *Based on partial or full coal mine bond releases. Source: Ky. Department for Surface Mining Reclamation and Enforcement.*

Coal Mine Bond Forfeitures

Indicator 5. Coal Mine Bond Forfeitures

At a Glance

Coal mine operations with bonds 7,958
value . . . . $792 million

Forfeiture of bonds in 1999
mine operations . . 28
acres 701
value $890,000

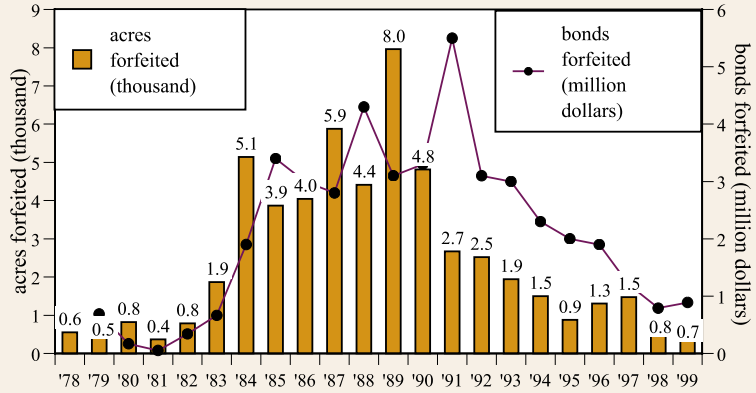
Background All coal mines are required to post financial assurance bonds to ensure reclamation of a site. Bond amounts vary based on the mine and type of operation. State regulatory officials currently hold $792,438,602 in bonds for 7,958 coal mine operations, 2,349 of which are active operations.

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

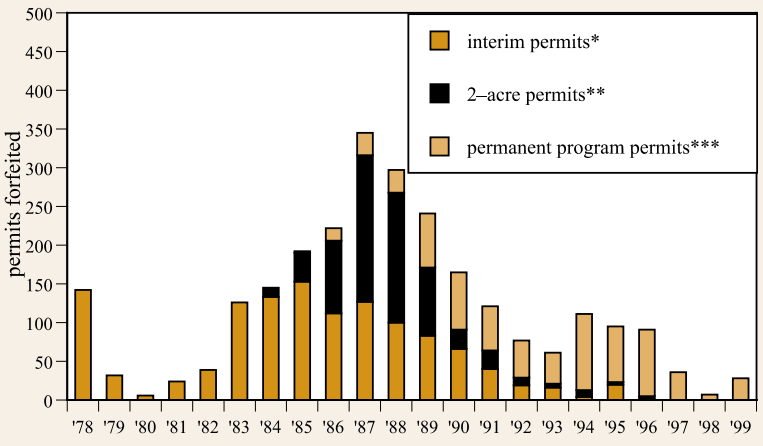
Progress The forfeiture of coal mine permits and bonds due to the failure to properly operate or reclaim a site continues to decline in Kentucky. In 1999, $890,000 in bonds were forfeited under 28 coal mine permits containing 701 acres. This forfeited acreage represents less than 1 percent of the 95,000 acres completely or partially reclaimed in Kentucky that year.

In the past, concerns had been expressed that coal mine bonds were inadequate to reclaim a mine site. A 1993 study commissioned by the state found that 36 percent of the 42 mines assessed were considered to have inadequate reclamation bonds. In response, the state created a Supplemental Assurance Fund in 1994 to assure reclamation of sites with approved highwalls in excess of normal regulatory requirements. Monies posted by the permittee are in addition to and distinct from the reclamation bond required under federal law. Monies are returned to the permittee once rough backfilling and grading have been completed. As of September 1999, the state held $38.3 million in supplemental assurance funds. The state also passed legislation in 1998 to create a bond forfeiture fund financed by interest accrued from forfeited bonds and penalties. The fund is used to supplement bonds that are inadequate to reclaim a forfeited mine site.

Measure 1. Coal Mine Bonds and Acreage Forfeited



Measure 2. Coal Mine Permits Forfeited



Measures - notes and sources

Measure 1. *Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 2. **Inerim permits - issued to coal mines in operation from 1978 to 1992. **2-acre permit exemptions - issued to 2-acre mine operations from 1982 to 1987 which exempted operations from some performance standards. The 2-acre exemptions were repealed in 1987 due to mining abuses. **Permanet program permits - cover operations that were active on or that began after 1982. Source: Ky. Department of Surface Mining Reclamation and Enforcement*

Indicator 6. Coal Mine Compliance and Enforcement Actions

Background The environmental impacts of coal mining have been regulated to some degree in Kentucky since 1966. But it was not until the passage of the 1977 federal Surface Mining Control and Reclamation Act (SMCRA) that the state began to more fully address the impacts of mining on the environment.

Kentucky obtained federal authority to carry out the provisions of the SMCRA in 1982. Since then, the Kentucky Department of Surface Mining Reclamation and Enforcement (DSMRE) has been the primary regulatory authority, while the U.S. Office of Surface Mining has maintained an oversight role to ensure compliance with the federal law. In 2000, DSMRE was responsible for overseeing compliance on 682 active and 1,565 inactive mine sites (inspectable units).[1]

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

At a Glance

Number of coal mine inspections
1990 43,000
1995 34,000
1999 26,000

Number of violations
1993. 2,097
1996. 1,619
1999. 757

Compliance of coal mines (1999) 81%

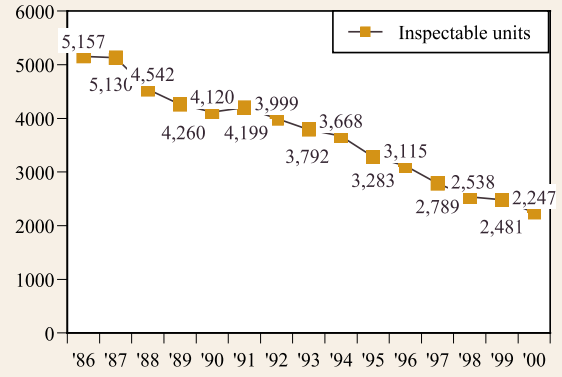
Progress The state is required by law to conduct eight partial and four complete inspections on each active coal mine permit per year. Inspections have been decreasing since 1986. DSMRE indicates that this decrease is primarily due to the decline in the number of mines and a shift from active to inactive mine sites due to the completion of mining and reclamation. During 1999, 103 inspectors conducted 26,000 complete and partial inspections of active mining operations.

Trends reveal that compliance with coal mining rules in Kentucky continues to improve. During 1999, the federal Office of Surface Mining reported that 81 percent of coal operations were in compliance with mining laws (based on random surveys). The number of citations issued by DSMRE dropped by more than half since EQC last reported on this indicator, from 1,801 in 1996 to 942 in 1999. During 1999, 45 percent of the active coal mine permits had one or more citations for violations of coal mining performance standards. This continued drop in citations is attributed to a decline in the number of permits issued, improved compliance of operators and a stronger state emphasis on preventative enforcement.

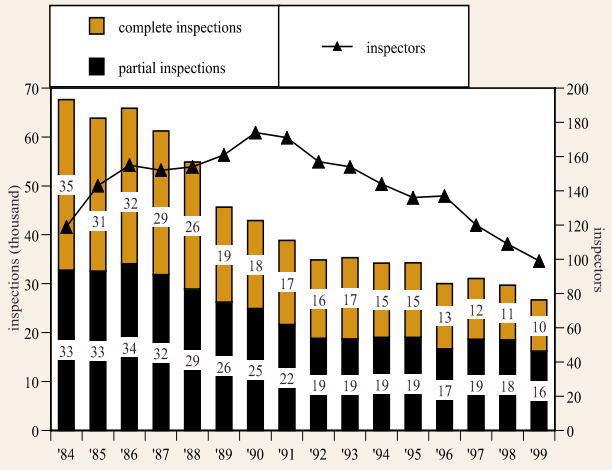
During 1999, off-site disturbances were the most frequently cited performance standard violation at coal mines, followed by backfilling and grading violations.

Penalties assessed against coal operators show declining trends as well. According to DSMRE, this decrease is attributed to violations that can be quickly abated because they are less serious in nature. This also reflects a trend in coal mining toward fewer and larger companies that are more able to meet regulatory requirements and remedy violations in a timely manner, according to state officials. In fiscal year 1999, $3.34 million in penalties were assessed and $959,000 in coal mine penalties were collected. The penalties collected have remained fairly constant during the past several years, averaging 27 percent of fines assessed each year. According to DSMRE, a large amount of fines cannot be collected due to bankruptcies or a lack of company assets.

Measure 1. Number of Coal Mine Inspectable Units in Kentucky



Measure 2. Inspections of Coal Mines

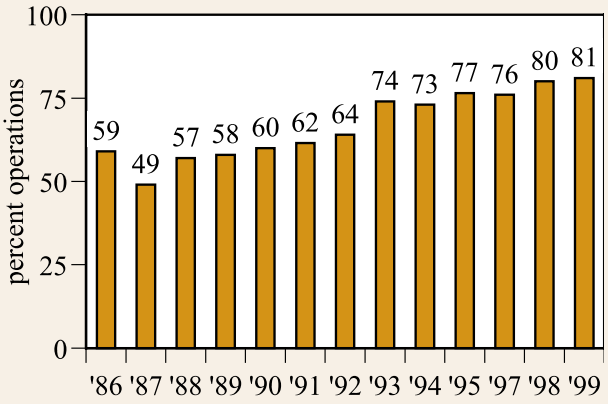


Coal Mine Enforcement

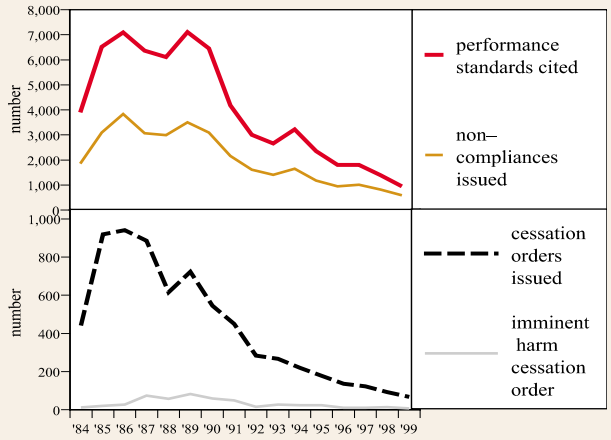
Footnotes

1. Eighteenth Annual Evaluation Summary Report for the State of Kentucky, Table 6b, U.S. Office of Surface Mining.

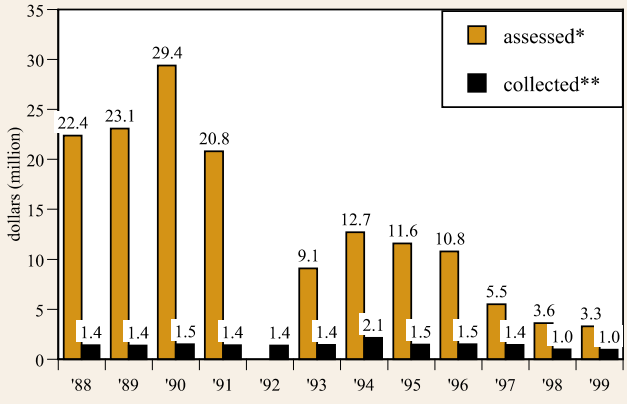
Measure 3. Kentucky Coal Mine Compliance



Measure 4. Coal Mine Violations in Kentucky



Measure 5. Coal Mines Penalties



Measures - notes and sources

Measure 1. *OSM Annual Evaluation Report, 2000.*

Measure 2. *Includes 8 partial and 4 complete inspections per active coal mine permit per year. Includes inspections of inactive and abandoned mines. Source: Ky. Dept. of Surface Mining Reclamation and Enforcement.*

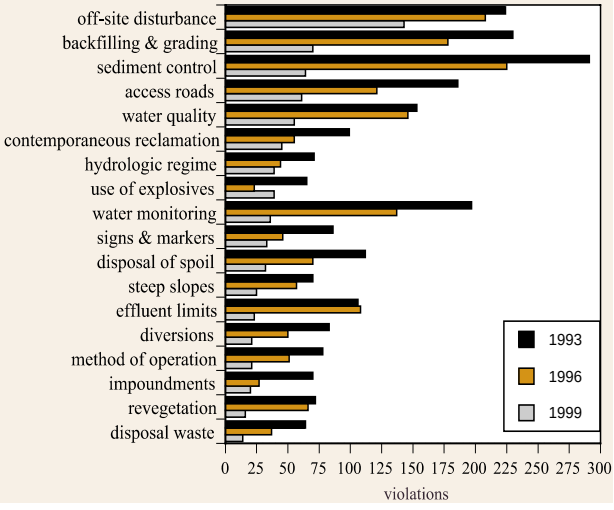
Measure 3. *Based on random oversight inspections conducted by the federal Office of Surface Mining. 1996 data not included due to changes in inspection procedures. Source: U.S. OSM Annual Evaluation Reports.*

Measure 4. *Performance standards - specific standards that must be met according to state and federal rules. Noncompliance - documents violations, remedial measures and schedules for completion of actions. Cessation order - requires operator to cease operations for failure to abate violation and until violation is corrected. Imminent harm cessation order - requires operator to cease operations due to imminent harm or potential danger to the public and environment. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 5. **1992 data not available due to computer problems. **Collections may include assessments from any given year. Source: Ky. Natural Resources and Environmental Protection Cabinet, Office of Administrative Hearings.*

Measure 6. *Based on violations of performance standards. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 6. Most Frequently Cited Coal Mine Violations in Kentucky



RESOURCE EXTRACTION

COAL MINE COMPLAINTS

Indicator 7. Coal Mine Complaints

Background Each year, hundreds of complaints concerning active, inactive and abandoned coal mines are received by state officials. State officials are required to investigate all complaints. Many complaints concern coal mine blasting. Kentucky leads the nation in the use of explosives. In 1999, 2.12 million metric tons of explosives were sold in the United States—411,000 metric tons of which were sold in Kentucky. Coal mining accounts for 67 percent of the total national sales of explosives.[1]

Goal To protect people and property, land, water and other natural resources, and aesthetic values, during mining activities and ensure the restoration and reclamation of surface areas affected by mining activities.

Progress During 1999, state surface mining officials received 846 citizen coal mine related complaints, the lowest number recorded since 1984. State officials note that this is likely due to the steady decrease in the number of mines in Kentucky. About 11 percent of citizen complaints result in a coal mining operation being cited for a violation.

Forty-two percent of the coal mine complaints concerned blasting. Since 1996, the number of blasting related complaints has increased by 24 percent. Blasting complaints often allege subsidence and damage to private water well supplies. In 1992, the federal surface mining law was amended to require all underground coal mining operations to promptly replace certain identified water supplies adversely affected by subsidence from underground coal mining operations. In response to the new federal requirements, the Kentucky General Assembly passed a bill in 1994 requiring replacement of water supplies lost due to underground mining. Between 1994 and 1999, 596 cases alleging underground coal mining damage to water supplies have been filed under the provisions of the law.

At a Glance

Number of coal mine complaints
1990 983
1995 954
1999 846

Leading coal mine complaints (percent)
blasting 42%
water quality 9%
off-site 6%
dust 5%
subsidence 4%

Footnotes

1. Explosives" by Deborah Kramer, Institute of Makers of Explosives, 1999.

Measures - notes and sources

***Measure 1**. *General obligation refers to: illegal disposal of waste outside of permit area, causing imminent danger to public or the environment, lack of a permit, or failure to notify DSMRE of problems. Based on 846 complaints received in 1999. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

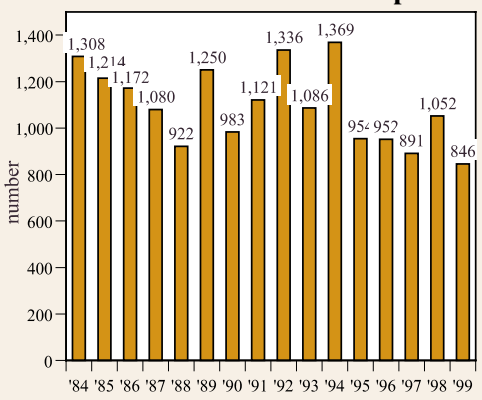
***Measure 2**. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

***Measure 3**. Source: Institute of Makers of Explosives.*

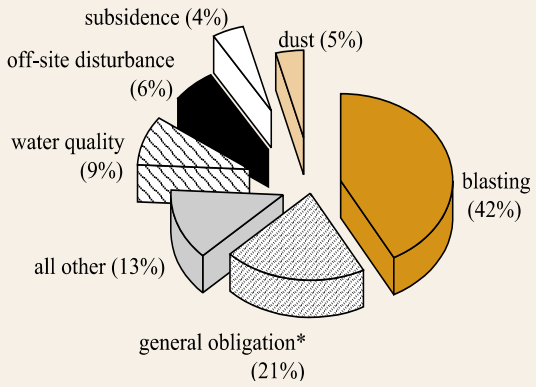
Measure 3. Leading States for Explosives Consumption (1999)

State	metric tons
Kentucky	**411,000**
West Virginia	214,000
Nevada	125,000
Pennsylvania	114,000
Arizona	109,000
Virginia	96,000
Alabama	92,000
Ohio	70,000
Missouri	47,000
North Carolina	46,000

Measure 2. Coal Mine Complaints



Measure 1. Coal Mine Complaint Types



Abandoned Mine Lands

Indicator 8. Abandoned Mine Lands

At a Glance

Abandoned mine land acres reclaimed.20,095
# of projects . . 1,300

Abandoned mine lands in Kentucky still requring reclamation . . 80,000-150,000 acres

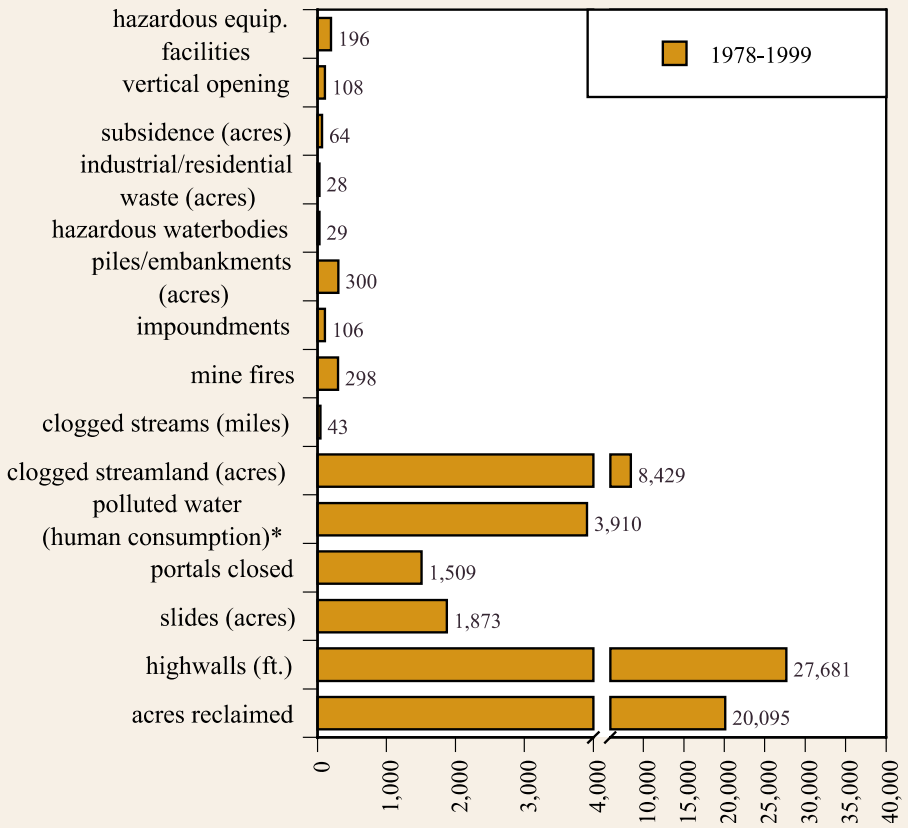
AML fund (million of dollars)
fee collection. . $759.2
awards $350.1

Background The federal Abandoned Mine Land Reclamation Program (AML program) was established to address mine lands abandoned prior to 1982. Kentucky received federal authority to carry out this program in 1982. The Kentucky Division of Abandoned Mine Lands oversees all AML projects in the state with the exception of emergency projects, which are handled by federal Office of Surface Mining.

The AML program is supported by a fee of 35 cents per ton on surface mined coal, 15 cents per ton on coal mined underground, and 10 cents per ton on lignite. This money is held in an interest bearing Abandoned Mine Land and Reclamation Fund (AML fund) by the federal government and allocated back to states and tribes for mine reclamation purposes. The fee is authorized until 2004.

Expenditures from the AML Fund are authorized through the regular congressional budgetary and appropriations process. Federal law specifies that 50 percent of the AML fees collected be returned to the state of origin for reclamation projects. The remainder of the fees are retained by the federal government to support administrative costs of the program, emergency reclamation projects, and additional discretionary grants to the states based on historical coal extraction.

Measure 1. Abandoned Mine Land Projects in Kentucky



Goal Provide for the restoration of lands mined and abandoned or left inadequately restored prior to 1977.

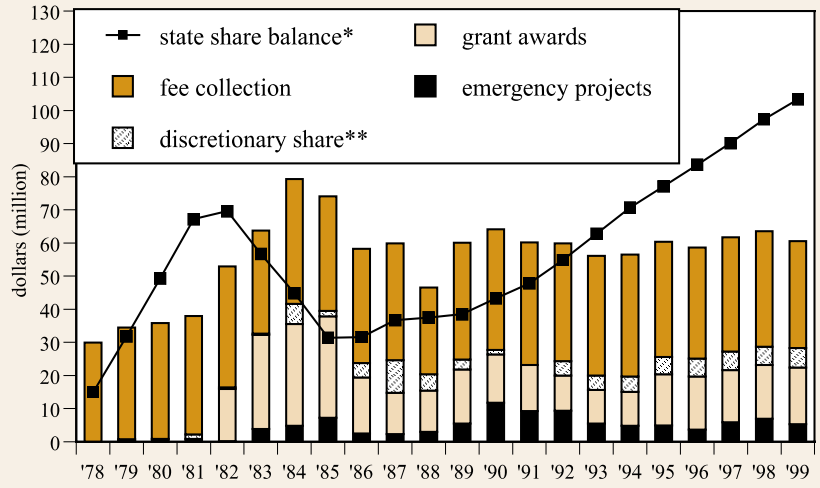
Progress Nationwide, from 1978 through 2000, $5.8 billion in AML fees have been collected and $1.3 billion worth of coal-related high priority sites reclaimed.[1] In Kentucky, the coal industry has paid $759.2 million in AML fees. The state has received $350.1 million in AML grants. Of this total, $74.2 million was in discretionary AML funds based on historical coal extraction. The state's share balance (what is owed to the state and held in trust by Congress) was $101 million in 2000.[2]

From 1978 to 2000, Kentucky reclaimed 20,095 acres of abandoned mine lands using AML funds, and more than 1,300 projects were com-

pleted to address abandoned mine land problems.[3]

Most AML funds used in Kentucky are for restoring sites and for projects that pose imminent threats to human health and safety. Projects include the elimination of highwalls, clearing clogged streams, restoring potable water supplies and stabilizing slides. During 1998 and 1999, Kentucky undertook a major abandoned mine land reclamation project. The Pleasant View Mine Site, located near Madisonville, was mined in the 1930s and 40s. Later mining operations in the 1960s left millions of tons of acid coal refuse polluting water in a large pit to such a degree that it was a deep red color and became known as "Ketchup Lake." The site was classified as a threat to public health and safety in 1997. Reclamation activities moved and estimated 2.5 million cubic yards of materials at a cost of $4 million. The reclamation of the 250-acre site has resulted in the restoration of Grassy Creek watershed. The project was recognized by the U.S. Office of Surface Mining in 2000 and received a regional and national award from the agency.

Measure 1. Abandoned Mine Land Fund Fee Collection and Allocation in Kentucky



Nationwide, some 16,870 projects, amounting to $8.2 billion, await AML funding.[4] There are an estimated 80,000 to 150,000 acres of abandoned mine lands in Kentucky that are potentially eligible for reclamation.[5]

Footnotes

1. Abandoned Mine Reclamation Update, Office of Surface Mining, 2000.
2. State Share Balance, Current status, Office of Surface Mining, Web site - http://www.osm.gov/fundstateshare.htm.
3. Ky. Division of Abandoned Mine Lands.
4. Abandoned Mine Reclamation Update, Office of Surface Mining, 2000.
5. As estimated by the Ky. Division of Abandoned Mine Lands.

Measures - notes and sources

***Measure 1**. *Selected state AML priority 1 & 2 (protection of public health, safety, and general welfare) and federal AML emergency projects. *Customers served. Source: U.S. Office of Surface Mining.*

***Measure 2**. *Cumulative balance of fees collected and not returned to Kentucky as specified under federal AML law. **Additional AML Funds based on historical coal extraction. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

***Measure 3**. *Funds reobligated to the 19th annual grant. Source: Ky. Department of Surface Mining Reclamation and Enforcement.*

Measure 3. AML Program in Kentucky (1999)

Receipts	
AML Grant	$18,609,414
Expenditures	
Program Adm.	$3,505,645
Project Costs	$14,032,416
Deobligated*	$1,071,353
Projects Funded	
Clogged streams	14.2 acres
8 waterlines	78.3 miles
Haz. waterbodies	4
Portals closed	36
Slides	89.9 acres
Haz. equipment	12
Highwalls	2,306 feet
Vertical openings	3
Piles & embankments	16.3 acres

Oil & Gas Production

Indicator 9. Oil and Natural Gas Production and Consumption

At a Glance

Number of oil wells
1992 730
1995 612
1999 226

Oil production (million barrels a day)
1992 15
1995 10
1999 8

Number of gas wells
1992 303
1995 249
1999 341

Natural gas production (trillion cubic feet)
1992 80
1995 75
1999 77

Background Kentucky and the nation consume large amounts of petroleum and natural gas to meet our energy needs. In fact, the United States is the world's greatest consumer of petroleum—using two to three times more than any other country.[1] In Kentucky, the consumption of petroleum for transportation alone rose 188 percent between 1960 and 1999.[2] This trend reflects the increased mobility of Kentucky's growing population as well as expansion of airports and increased airline traffic.

Kentucky has been producing oil and natural gas since 1818. In 1999, the value of oil and natural gas production was more than $200 million, bringing Kentucky more than $9 million in tax revenues.[3] The state has large untapped natural gas resources that include shut-in shallow production, coalbed methane and considerable deep potential.[4]

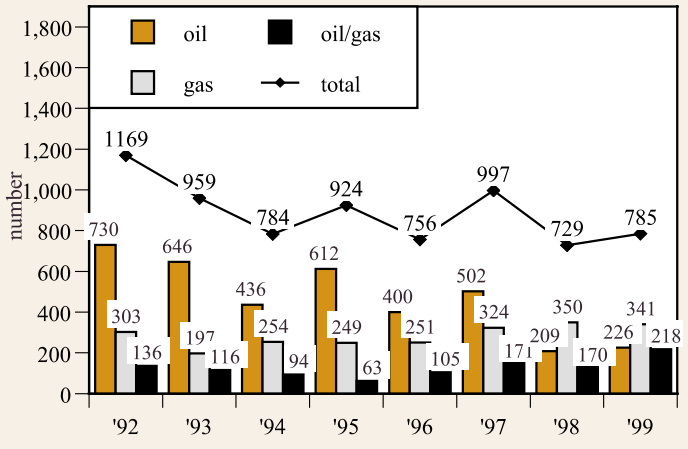
Goal Foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

Progress The state began a permitting program for oil and gas wells in 1960. Since then, 90,838 oil and gas permits have been issued of which 46,134 are productive wells. The total number of oil and gas permits issued each year continues to decline, primarily due to market conditions and falling oil prices.

Kentucky ranks 20th among 31 states with oil production.[5] The state produced 2.8 million barrels of oil in 1999, about 0.13 percent of the 2.1 billion barrels produced in the United States that year. Oil production occurs in 59 counties. During 1999, 49 percent of the state's oil production occurred in west Kentucky. Crude oil production levels have been steadily declining in the state, dropping from 17,704 barrels a day in 1986 to 7,560 barrels a day in 1999. This decline is attributed to the low and variable price of crude oil on the world market. However, price increases in 2000 (if maintained) and growing demand may lead to increased oil production in Kentucky. Kentucky's and the nation's consumption of finished petroleum products continues to increase. For example, between 1986 and 1999, U.S. petroleum consumption rose by 19 percent while Kentucky use increased by 35 percent.

Kentucky ranks 17th among 29 states with natural gas production.[6] In 1999, the state produced 77 billion cubic feet; 0.38 percent of the nation's 24 trillion cubic feet of gas. There are 24 active natural gas fields covering 35 counties. Nearly all natural gas production, about 99 percent, occurs in the eastern part of the state. Officals at the Kentucky Geological Survey predict that rising natural gas prices will likely lead to an increase in gas production over the next few years in Kentucky. The preliminary gas production estimate for the year 2000 in Kentucky is about 80.8 billion cubic feet, a five percent increase over 1999 production levels.[7]

Measure 1. Oil and Gas Permits in Kentucky



Footnotes

1. U.S. Department of Census. Statistical Abstract of U.S., 2000.
2. State Energy Data Reports, Energy Information Administration, 1960-97.
3. Kentucky Geological Survey, Web site - http://www.uky.edu/KGS/emsweb/oginfo/intro.html.
4. Ibid.
5. Petroleum Annual 1999, Energy Information Administration.
6. Natural Gas Annual 1999, Energy Information Administration.
7. Ky. Geological Survey, May 2001.

RESOURCE EXTRACTION

OIL & GAS PRODUCTION

Measures - notes and sources

Measure 1. **As issued by Ky. Division of Oil and Gas. Data prior to 1992 not available. Source: Ky. Department of Mines and Minerals.*

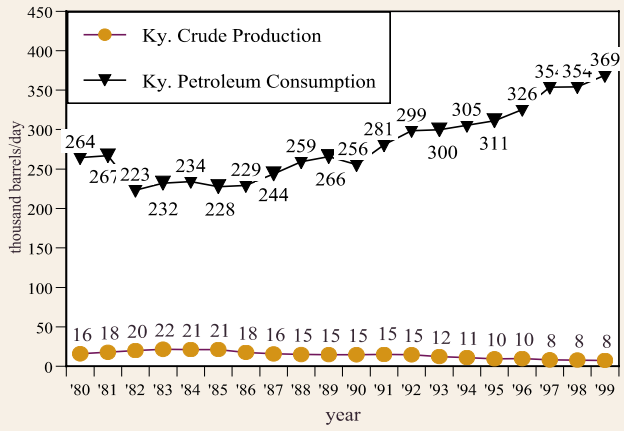
Measure 2. *Totals rounded. 1999 is the most recent data for petroleum consumption in Kentucky. Source: U.S. Energy Information Administration, Ky. Geological Survey.*

Measure 3. *Source: Ky. Geological Survey.*

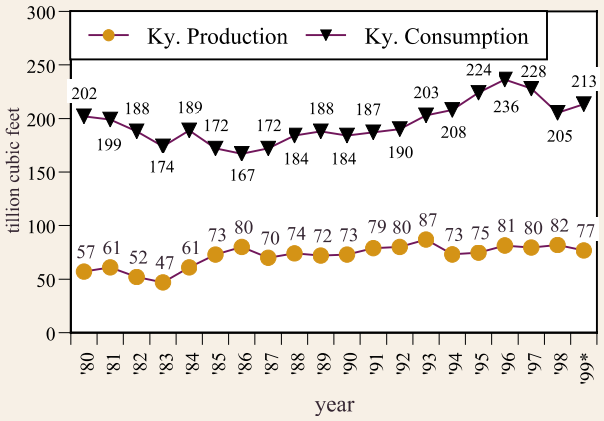
Measure 4. *Source: U.S. Energy Information Administration.*

Measure 5. *Source: Ky. Geological Survey.*

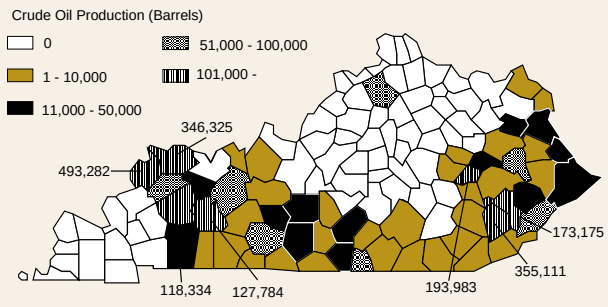
Measure 2. Crude Oil Production/ Petroleum Consumption in Kentucky



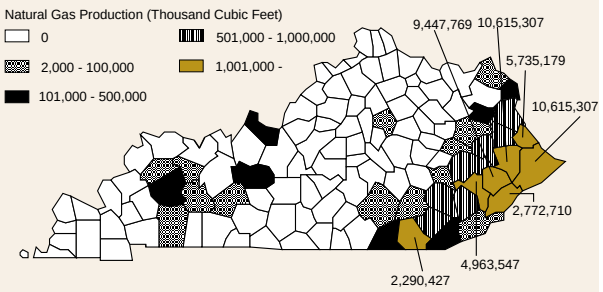
Measure 4. Natural Gas Production/ Consumption in Kentucky



Measure 3. Crude Oil Production in Kentucky (1999)



Measure 5. Natural Gas Production in Kentucky (1999)



Oil & Gas Enforcement

Indicator 10. Oil and Gas Well Compliance and Enforcement

At a Glance

Inspections of oil and gas wells
1992 2,822
1995 3,740
1999 2,823

Violations at oil and gas wells
1992 1,702
1995 532
1999 1,316

Background The Kentucky Department of Mines and Minerals, Division of Oil and Gas was established in 1960 to foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

State oil and gas officials report that most environmental problems occur at older oil wells and small independently-owned wells. Pollution from oil and gas wells can be caused by oil, grease and brines associated with production. Brine, which can contain more salt than sea water, is currently impairing water quality in five of the state's 13 river basins.

Goal Foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

Progress During 1999, the Division of Oil and Gas 16 inspectors conducted more than 2,823 inspections of oil and gas operations. At least four inspections are conducted during the life of a well to ensure proper construction, operation and plugging.

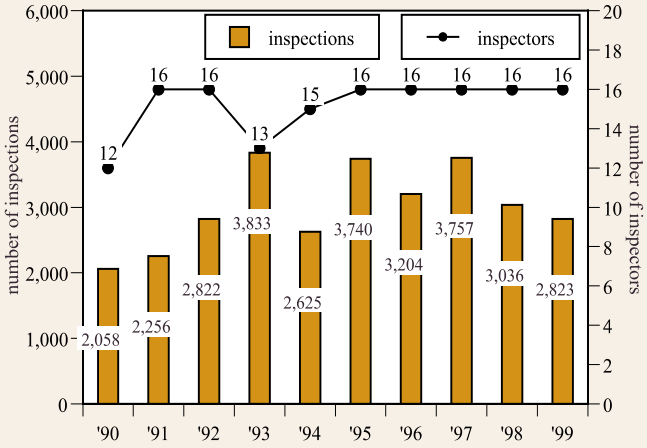
During 1999, 1,316 violations were cited at oil and gas wells by the Division of Oil and Gas inspectors. Improper well closure was the leading violation, accounting for 43 percent of 1,316 violations cited. The greatest number of the violations cited in 1999 occurred in Ohio County (127 violations), followed by Daviess County (77 violations), Clay County (57 violations), Hancock County (57 violations), McLean County (53 violations), and Adair County (46 violations).

Inspections are also conducted at oil and gas wells by Division of Water inspectors. During 1999, 3,924 inspections were conducted and 65 water quality violations were cited at oil and gas well operations. Division of Water officials report that a strong enforcement presence combined with better industry compliance and a decline in oil production have reduced violations and the level of chlorides in several waterways.

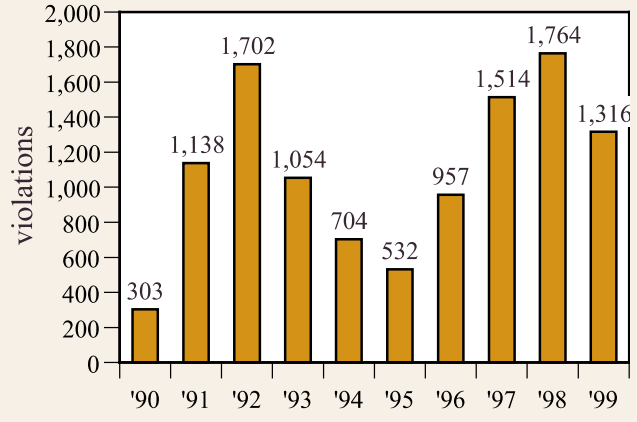
Division of Oil and Gas inspectors also responded to 42 citizen complaints in 1999 — a relatively low number considering there were 46,134 producing oil and gas wells. Most complaints concern abandoned wells, groundwater or dust.

Because the Division of Oil and Gas does not have the authority to assess fines against violators, it must rely on bond forfeitures as its primary enforcement tool. In 1999, 85 bonds were forfeited—the lowest number since 1991, when EQC began to report on oil and gas bond forfeitures. State officials attribute the recent decline in bond forfeitures to market pressures which have forced many marginal operators out of business. But the ratio of oil and gas bond releases to bond forfeitures still remains high. For example, in 1999, 100 bonds were released while 85 were forfeited. Bond amounts were increased in 1994 and now range from $500 for an individual well to $10,000 for multiple wells (based on well depth). However, state officials indicate that bond amounts still do not cover the complete cost of plugging and reclaiming a well site.

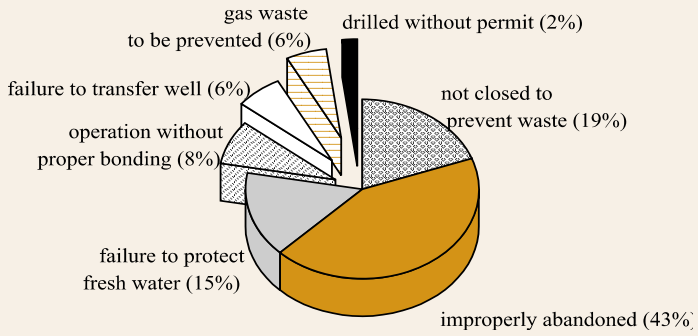
Measure 1. Oil and Gas Well Inspections



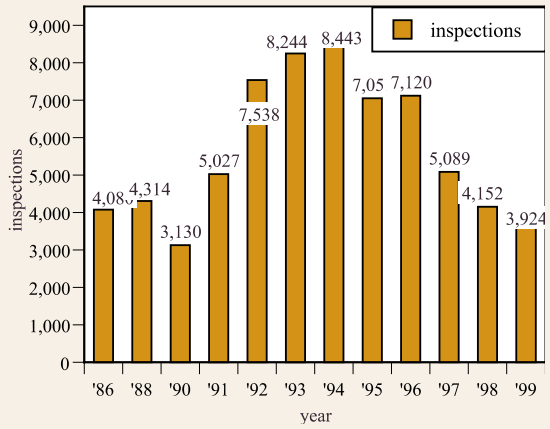
Measure 2. Oil and Gas Well Violations



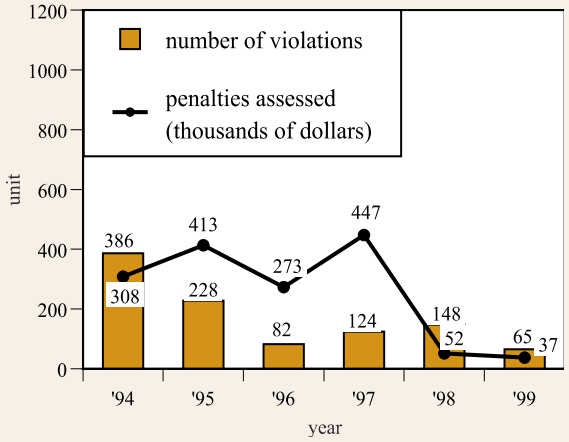
Measure 3. Oil and Gas Violations by Type



Measure 4. Oil and Gas Well Water-Quality Inspections in Kentucky



Measure 5. Oil and Gas Well Water Quality Violations



Another environmental threat posed by oil wells is waste created during the oil recovery process. Naturally occurring radioactive materials (NORM) can be brought to the surface and concentrated in oil pits and tank batteries. NORM was discovered in Kentucky in the Martha Oil Fields in Lawrence and Johnson counties in 1988. In 1995, the Cabinet for Health Services signed an agreement with Ashland Exploration Inc. to remediate certain NORM-impacted areas of the Martha Oil Field. To date, Ashland has excavated and is storing approximately 117,000 tons of NORM on a 3.77 acre site that straddles the border of Johnson and Lawrence Counties, with 2.89 acres in Johnson County and 0.88 acres in Lawrence County. The site is bounded by another 1,272 acres of company-owned property.

The Kentucky Natural Resources and Environmental Protection Cabinet has stated that the NORM-contaminated soil is a commercial residual solid waste. Ashland, Inc., filed a petition on May 22, 2000 to declare the NORM-contaminated soil a special waste. If NORM is declared a special waste, a notice would call for public comment on the issue. The cabinet is still formulating a draft decision.

Measures - notes and source

Measure 1. *Source: Ky. Division of Oil and Gas.*
Measure 2. *Source: Ky. Division of Oil and Gas.*
Measure 3. *Source: Ky. Division of Oil and Gas.*
Measure 4.. *Inspections conducted and violations cited by the Division of Water Field Operations Branch. Earlier data not available. Source: Ky. Division of Water.*
Measure 5. *In 1997 $150,000 of the $447,000 assessed was settled by the Cabinet for $30,000 in 1998 and this settlement is included in the 1998 number. Source: Division of Water.*

Abandoned Oil & Gas Wells

At a Glance

Number of abandoned oil and gas wells
U.S. 343,000
Kentucky 7,875

Number of wells plugged each year by state 200

Abandoned wells plugged to date by state 1,505

Indicator 11. Abandoned Oil and Gas Wells

Background According to the Interstate Oil and Gas Compact Commission, there are an estimated 343,030 idle wells in the United States that require proper plugging.[1] State law requires the Department of Mines and Minerals to regulate the plugging of all oil and gas wells in Kentucky. Administrative regulations promulgated under this authority identify the minimum acceptable requirements to plug or temporarily abandon wells. Unless written permission is obtained from the department, no operator or owner shall permit any well drilled for oil, gas, salt water disposal or any other purpose in connection with the production of oil and gas to remain unplugged after such well is no longer used for the purpose for which it was drilled or converted.

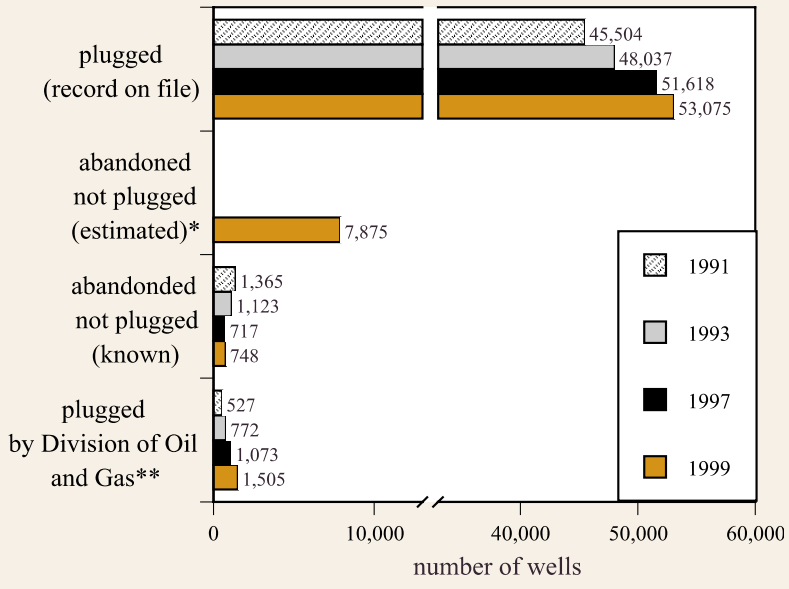
There are an estimated 7,875 abandoned oil and gas wells in Kentucky.[2] Improperly abandoned oil, gas and exploration wells pose a potential threat to the quality of groundwater supplies. Proper abandonment procedures require installation of cement plugs in the borehole to prevent migration of toxic fluids into nearby water-bearing formations. In some cases, however, plugs are installed improperly or neglected entirely, allowing oil, gas, brine and other unwanted material to contaminate freshwater aquifers.[3]

Goal Foster conservation and exploration, protect the rights of land and mineral owners, and regulate construction/operation of oil and gas wells.

Progress State records reveal that more than 53,000 oil and gas wells have been plugged in Kentucky. During 1997, 1998 and 1999, an average of 485 wells was closed and plugged per year.

State efforts to plug abandoned oil and gas wells continue. The plugging of abandoned oil and gas wells is funded with interest money accrued from oil and gas reclamation bonds and bond forfeitures. The interest generally raises $400,000 a year—enough money to plug about 200 wells. As of 1999, the Division of Oil and Gas had plugged 1,505 abandoned oil and gas wells. Abandoned wells are prioritized and plugged based on potential hazards to the

Measure 1. Number of Plugged and Abandoned Oil and Gas Wells in Kentucky



environment. The average plugging cost is about $1,973 per well.[4]

The U.S. Environmental Protection (EPA) currently permits and regulates the injection of fluids and disposal of brine produced by oil and gas wells. There are 1,667 underground injection wells permitted in Kentucky. Another 1,645 wells are permitted but inactive. The Underground Injection Control program reports that a cumulative total of 2,288 injection wells in Kentucky have been closed and plugged to date. During 2000, 26 enforcement actions were taken by the U.S. EPA against operators for failure to comply with underground injection well rules.

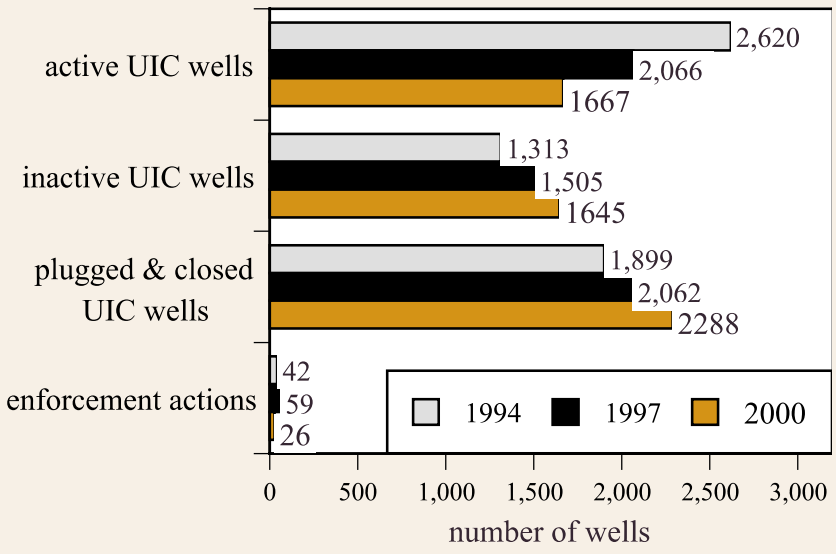
Footnotes

1. *Press Release, Interstate Oil and Gas Compact Commission, August 2, 2000.*
2. *As estimated by the Ky. Division of Oil and Gas.*
3. *"Abandoned Wells Pose Threat to Water Quality," R. F. Kubichek, Associate Professor, J. C. Cupal, Associate Professor, S. Choi, Ph. D.Candidate, Electrical Engineering Department, University of Wyoming, January 1999.*
4. *Ky. Division of Oil and Gas.*

Measures - notes and sources

Measure 1. **Data revised by Ky. Division of Oil & Gas that appeared in previous State of Kentucky's Environment reports. **Cumulative total of oil and gas wells plugged by the Ky. Division of Oil & Gas. Source: Ky. Department of Mines and Minerals.*
Measure 2. *U.S. Environmental Protection Agency.*

Measure 2. Underground Injection (UIC) Wells in Kentucky



Chapter 8

Energy

Indicator 1. Energy Consumption

Background The United States is one of the highest per capita consumers of energy in the world. The American Almanac reports that while accounting for only five percent of the world's population, Americans consume 26 percent of the world's energy. In 1997, United States residents consumed an average of 12,133 kilowatt-hours of electricity each, almost nine times greater than the average for the rest of the world.

Kentucky ranks 18th in the nation in energy consumption. Energy consumption rastes have been steadily increasing for the past 3 decades. The trend reflects a growing economy, a larger population and increased demand. Total Btu energy generation in Kentucky has increased by 64 percent between 1970 and 1999.

The primary energy sources in Kentucky are coal, petroleum and natural gas. Only a small portion of the energy consumed in Kentucky is considered renewable. During 1999, renewable energy (hydroelectric, solar, wind power and biomass) provided two percent of the energy consumed in the state, compared to seven percent nationwide.[1]

Goal Provide for the Commonwealth's energy needs in the most efficient and cost-effective way possible while protecting the environment and conserving our natural resources.

At a Glance

Energy production in Kentucky (trillion Btu)

1960	825
1970	1,116
1980	1,402
1990	1,417
1999	1,830

Energy sources (percent consumption - all users)

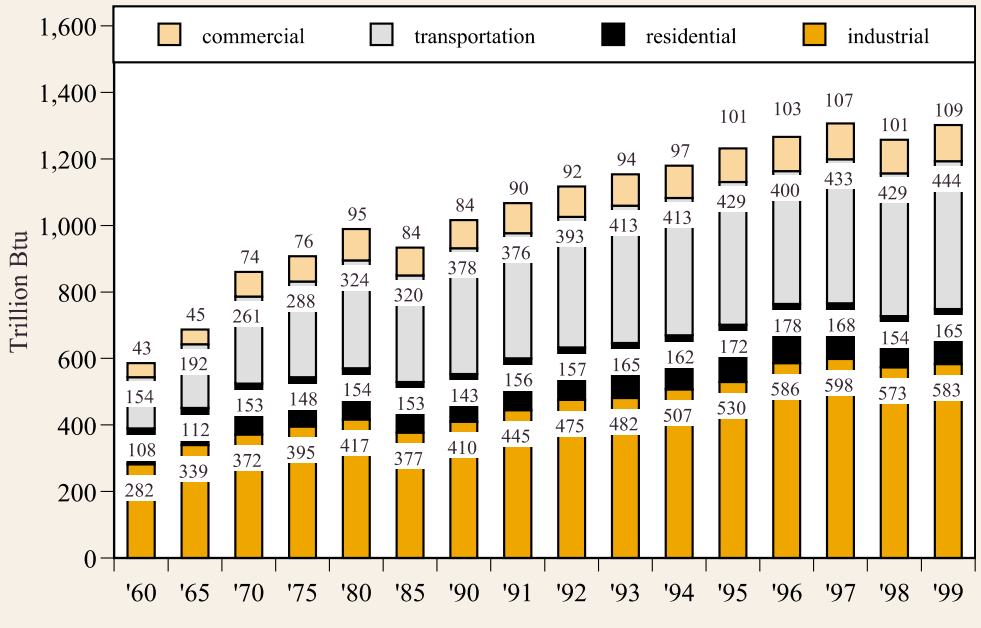
coal	48%
petroleum	40%
natural gas	12%
renewable	2%

Progress Kentucky has been outpacing the nation in the consumption of energy on a per capita basis. Since 1990, the state's per capita energy use has increased 16 percent compared to the national average of 4 percent. Kentucky ranks eighth in the nation for per capita energy use.

The most likely reason for the state's higher per capita energy use is the number of energy-intensive industries, such as aluminum, paper, chemical plants and a uranium processing facility, that are located in the state. Kentucky manufacturers also produce a large number of automobiles, which is another energy-intensive industry. In 1999, Kentucky ranked 13th in the nation in industrial energy use. Industrial energy consumption in Kentucky grew by 42 percent between 1990 and 1999, following a 107 percent growth trend during the past four decades. During 1999, petroleum accounted for 47 percent of the energy consumed by the industrial sector, followed by electricity (24 percent) and natural gas (17 percent).

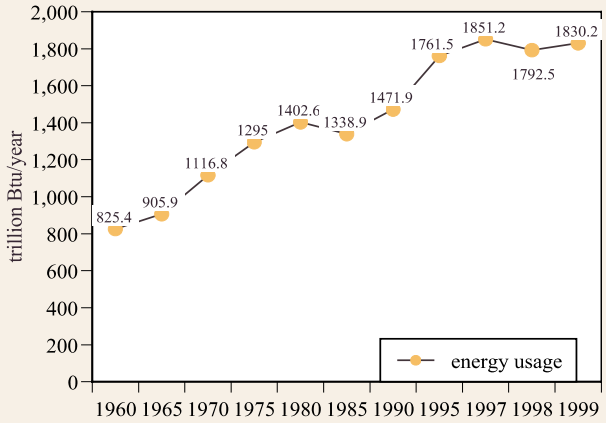
During the past 39 years, commercial energy consumption in Kentucky has increased a dramatic 153 percent. The growth of energy consumption for

Measure 1. Energy Consumption in Kentucky

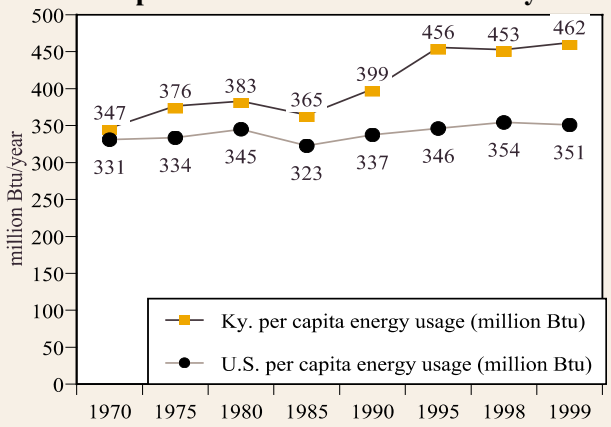


Energy Consumption

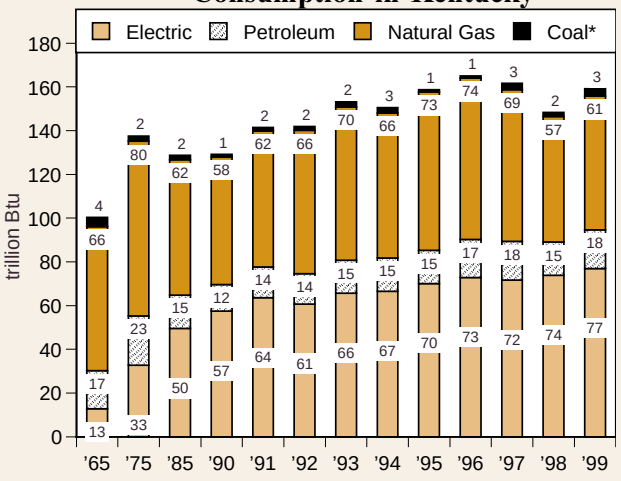
Measure 2. Total Btu Production in Kentucky



Measure 3. Per Capita Energy Consumption in the U.S. and Kentucky



Measure 4. Residential Energy Consumption in Kentucky



commercial purposes is directly related to the economy. For example, during the economic downturn of the 1980s, the state's commercial energy consumption declined by 12 percent. However, between 1990 to 1999, when Kentucky's and the nation's economy was growing, commercial energy consumption rose by 30 percent. Electricity supplied 48 percent of the commercial sector energy needs, followed by natural gas at 39 percent.

The amount of energy used in our homes increased by 15 percent between 1990 and 1999, continuing the same increasing trends seen in the past two decades. Kentucky ranks 23rd in the nation in residential energy use. The increase is linked to the state's expanding population and an increase in the size and number of houses.

In 1999, electricity supplied 46 percent of the energy consumed in our homes, followed by natural gas at 38 percent. A majority of the electricity generated in Kentucky (97 percent) is supplied by coal-fired power plants. Kentucky's power plants are the greatest consumers of energy in the state. During the past four decades (1960 through 1999) Btu consumption by power plants increased 315 percent. During 1999, 21 coal-fired power plants consumed 804 trillion Btu of energy to generate electricity in Kentucky, an increase of 13 percent since 1990. Natural gas may play an increasing role supplying power plants with fuel in the future as coal reserves decline or become more costly to mine, demand for electricity rises, and because burning natural gas generates less air pollution. In 1999, 659 additional megawatts of electric generating capacity was added to the state's existing 15,671 megawatts. This additional capacity was all gas-fired.[2] The Kentucky Division for Air Quality also reports that as many as 21 new power plants may be located in Kentucky in response to demand and utility deregulation. Currently there are 18,000 megawatts of electric-generating capacity in the state. Of these, 89 percent are coal-fired. Applications have been proposed for 12,000 more megawatts. The majority of these new power plants (65 percent) will be fueled by natural gas.

Energy consumed in Kentucky for transportation use grew by 17 percent between 1990 and 1999. During the past four decades this sector has seen energy use rise by 188 percent. Kentucky currently ranks 21st in the nation in transportation energy use. This is a reflection of the increased truck traffic traveling through Kentucky; a growing number of personal

vehicle miles driven each year as Kentuckians drive greater distances to their jobs; and the popularity of larger trucks, vans and sport utility vehicles, which tend to consume more gasoline.[3]

Footnotes

1. State Energy Data Report 1999 and U.S. Annual Energy Report 1999, Energy Information Administration.

***2.** Inventory of Electric Utility Power Plants in the U.S. 1999, Table 20, Energy Information Administration.*

***3 .** Kentucky Truck Trends, Web site - http://www.census.gov/econ/www/viusmain.html.*

Measures - notes and sources

***Measure 1.** 1999 data most recent available. Data has been refined since the 1992 State of Kentucky's Environment report. Does not include electrical system energy losses. Source: U.S. Department of Energy, Energy Information Administration State Energy Data Reports, 1960-99.*

***Measure 2**. Totals will not match totals in Measure 1 because of rounding errors and additional energy losses during the production of electricity. Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Reports, 1965-99.*

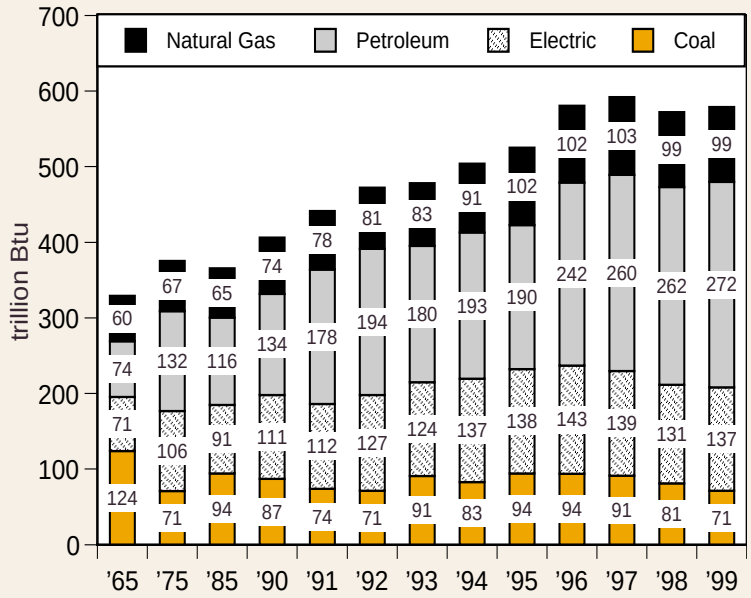
***Measure 3.** Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Reports, 1965-99.*

***Measure 4.** *Direct use of coal. Does not include electrical system energy losses. Wood not listed as an energy source. Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Reports, 1960-99.*

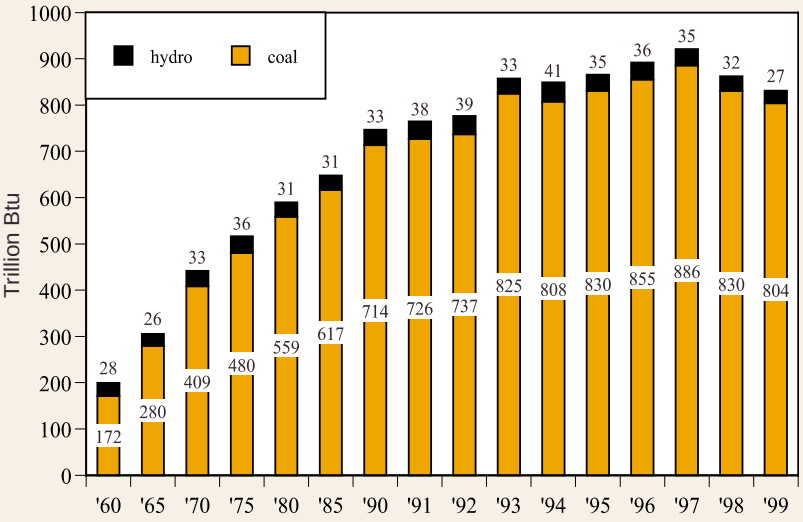
***Measure 5.** Does not include electrical system energy losses. Does not include wood and waste as an energy source. Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Reports, 1960-97 and U.S. Census Bureau.*

***Measure 6**. Source: U.S. Department of Energy, Energy Information Administration State Energy Data Reports, 1960-99.*

Measure 5. Industrial Energy Consumption in Kentucky



Measure 6. Electric Utility Energy Consumption In Kentucky



Energy Prices & Expenditures

Indicator 2. Energy Prices and Expenditures

At a Glance

Total energy expenditures in Kentucky (1997) . . . . . $9 billion

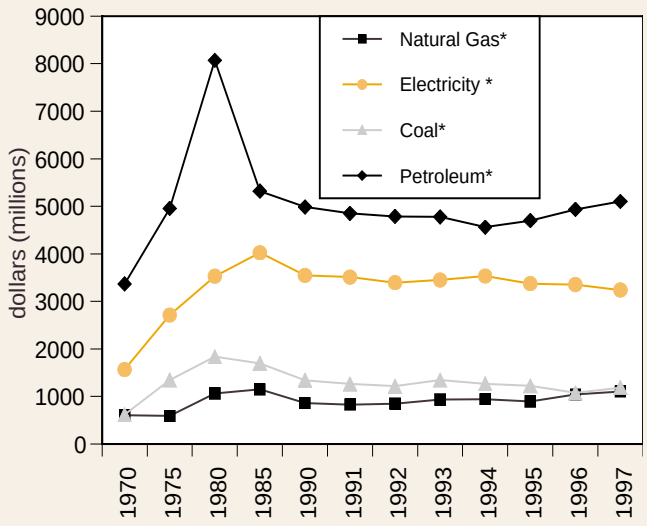
Percent of income Kentuckians spend on energy . . . 5 to 15%

Background Kentuckians spent nearly $9 billion in 1997, the most recent year data was available, for the commercial, industrial, transportation and residential use of energy.[1] It is estimated that the average Kentuckian spends 5 to 15 percent of their income on energy. The price the consumer pays for energy is dependent on factors such as production, demand, deregulation and the costs associated with energy generation and transmission.

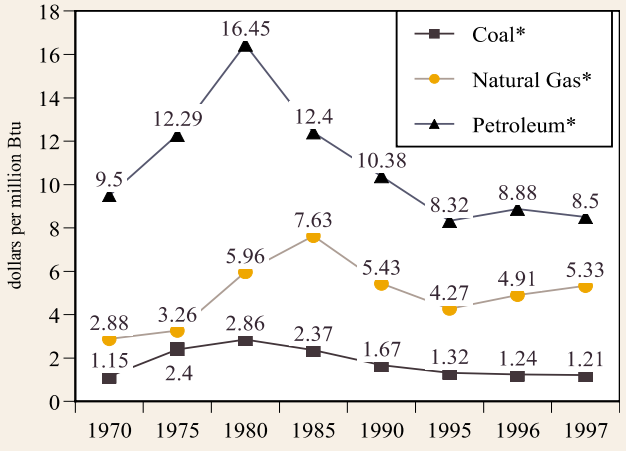
The cost of energy can greatly influence consumption patterns. The price of petroleum, natural gas and coal increased during the "energy crisis" era between 1970 and the mid-1980s. Since then, the prices for these fuels leveled out. But in 2000 and 2001, reduced supplies of natural gas and gasoline led to price increases in Kentucky and the nation.

Goal Provide for the Commonwealth's energy needs in the most efficient and cost-effective way possible while protecting the environment and conserving our natural resources.

Measure 1. Energy Expenditures in Kentucky



Measure 2. Energy Rates in Kentucky



Progress Transportation-related expenditures accounted for 35 percent (nearly $3.6 billion) of the $9 billion spent by Kentuckians for energy in 1997. Energy expenditures for petroleum have remained fairly level since 1995, but have since increased 8 percent between 1995 and 1997. Average gasoline prices in Kentucky have fluctuated greatly during the last two decades due to supply shortages, wholesale prices, increased demand and other factors. The highest average gasoline prices recorded to date were in 1980. However, gas prices in 2001 have risen due to supply disruptions brought about by high winter heating oil demand and breakdowns in production of reformulated gasoline.[2]

Total electricity expenditures have remained steady during the 1990s. Average electric rates in Kentucky are still among the lowest in the nation due to the proximity of coal resources. In 1999, the average electric price in Kentucky per kilowatt hour was 5.8 cents compared to the national average of 8.6 cents.[3]

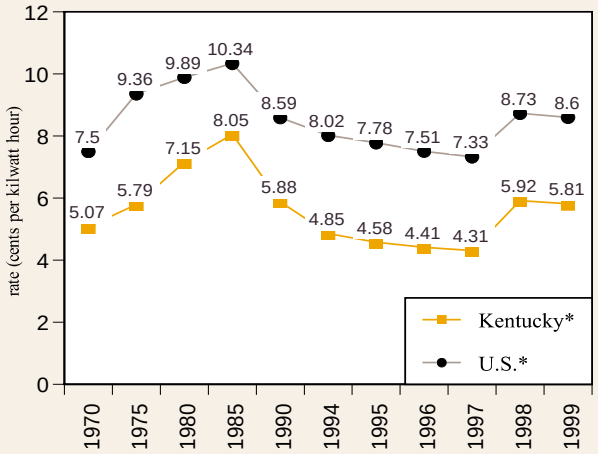
Controlling air pollutants emitted by coal-fired power plants, Kentucky's primary source of electricity, has also added to the cost of producing electricity. Some utilities have imposed environmental surcharges on customers and others are seeking approval to do so. For example, Kentucky Utilities and Louisville Gas and Electric have a 5.6 percent environmental surcharge to recover costs associated with scrubbers and other equipment to control sulfur dioxide emissions. These companies have also requested that the Kentucky Public Service Commission amend their existing environmental surcharges to recover the cost of complying with nitrogen oxide (NOx) provisions of the federal Clean Air Act. These utilities are proposing to install selective catalytic reduction (SCR) systems at 12 of their boilers at a cost of $500 million. The Tennessee Valley Authority (TVA) has also taken steps to control air pollution by installing SCR

systems at its Paradise Power Plant located in Muhlenburg County. This system is the first of 13 to be installed by TVA as part of a $750 to $800 million emissions reduction program. Once complete, these systems, plus boiler optimization controls and the operation of low-NOx burners, will reduce TVA's overall emissions of NOx by 70 to 75 percent. The utility is also decreasing its sulfur dioxide emissions by switching to low-sulfur coal and operating scrubbers at three plants.

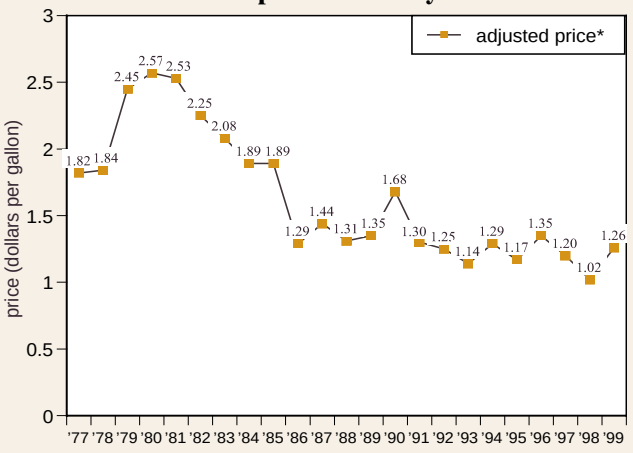
Natural gas expenditures in Kentucky were level between 1991 and 1995, but began to rise in 1996. However, prices have since soared to record levels. Between January 2000 and January 2001, the average nationwide price of natural gas increased 70 percent.[4] In Kentucky, prices rose 50 percent. Natural gas prices have increased due to a decrease in supply resulting from low prices in past years and an increase in demand as several natural gas power plants began operations, coupled with a cold winter. Because natural gas prices have been low for several years, there has been little incentive to drill and explore for natural gas, according to state energy officials.

Deregulation has also impacted natural gas prices and supplies in certain states where restructuring and deregulation has occurred, particularly in California. The goal of deregulation is to stimulate growth and help lower electric rates by opening up electric markets to competition. The Kentucky General Assembly established a task force in 1998 to study the electric deregulation issue and concluded that there was little immediate demand for major structural changes in Kentucky's electric industry, especially given the failure of California's electric industry deregulation.

Measure 3. Average Residential Electric Rates



Measure 4. Gasoline Prices at the Pump in Kentucky



Footnotes

1. *State-Level Energy Consumption, Expenditures, and Prices, 1997, Table 1.6, Energy Information Administration.*

2. *"What's driving higher gas prices in 2001," Alliance to Save Energy.*

3. *Electric Power Annual, Table A22: Retail Sales of Electricity, Revenue, and Average Revenue per Kilowatt-hour, Energy Information Administration.*

4. *"Residential Natural Gas Prices: What Consumers Should Know," Energy Information Administration, January 2001.*

Measures - notes and sources

Measure 1. **Adjusted for inflation using consumer price index for 2000. 1997 most recent data available. Source: U.S. Department of Energy, Energy Information Administration, Energy Data Reports 1970-97.*

Measure 2. **Adjusted for inflation using consumer price index for 2000. 1997 most recent data available. Source: U.S. Department of Energy, Energy Information Administration, Energy Data Reports 1970-97.*

Measure 3. **Adjusted for inflation using consumer price index for 2000. Source: U.S. Department of Energy, Energy Information Administration, Energy Data Reports 1970-97.*

Measure 4. **Prices are based on average pump costs on December 17 for self-serve, regular unleaded gasoline. All numbers are adjusted for inflation using consumer price index for 2000. Source: American Automobile Association, Louisville Office, 2000.*

Indicator 3. Energy and Transportation

At a Glance

Gasoline consumed for transportation . . . . . .
1980. . . 1.6 billion gal.
1990. . . 1.7 bllion gal.
1999. . . 2.1 billion gal.

Number of vehicles registered in Kentucky
1970 . . . . . 1.8 million
1980 . . . . . 2.7 million
1990 . . . . . 2.9 million
2000 . . . . . 3.4 million

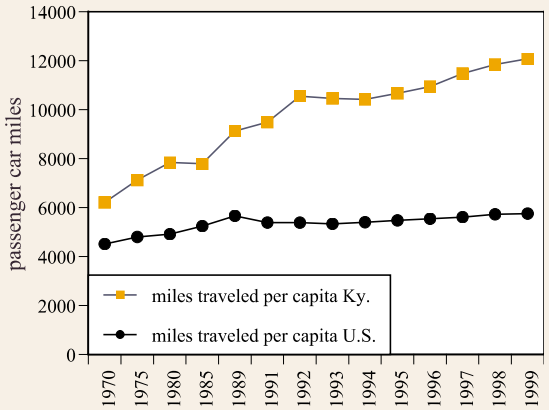
Average number of miles driven per person in Kentucky
1970. 6,210
1989. 9,217
1999. 12,072

Background Transportation accounts for 24 percent of all energy used in the state. Kentuckians consumed 2.1 billion gallons of gasoline for transportation activities in 1999, an increase of 20 percent since 1990. This short-term rise is typical of a long-term trend that reflects a 51 percent increase in gasoline consumption since 1970.

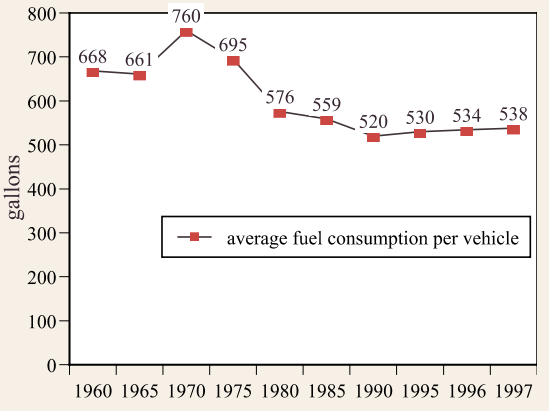
Goal Provide for the Commonwealth's energy needs in the most efficient and cost-effective way possible while protecting the environment and conserving our natural resources.

Progress The number of passenger vehicles registered with the state has increased 86 percent since 1970 and now numbers 3.4 million.[1] According to the Kentucky Transportation Cabinet, Kentuckians have doubled the average number of miles driven each year for personal travel as compared to 1970. In 1999, the average person in Kentucky traveled nearly 12,072 miles. Although the number of miles traveled has increased, the amount of gasoline consumed per vehicle has generally been declining since 1970, a result of improved fuel efficiency of vehicles. However, this trend began to reverse itself in the early 1990s with the popularity of less fuel-efficient vans, trucks, and sport utility vehicles. This category of vehicles has increased nationwide by 89 percent since 1985.

Measure 1. Per Capita Vehicle Miles Traveled in the U.S. and Kentucky



Measure 2. Average Fuel Consumption Per Vehicle in the U.S.



The use of cleaner, renewable fuels is an important component of federal strategies to curb air pollution, reduce U.S. dependence on foreign oil, and control emissions from burning fossil fuels that are associated with acid rain and global warming. Kentucky now has 33 refueling stations for compressed natural gas, ethanol and liquid propane gas. The U.S. Department of Energy estimates that there are 5,735 alternative-fueled vehicles in the state, an increase of 31 percent over 1998 levels.[2]

The national Energy Policy Act of 1992 requires state fleets to purchase vehicles powered by alternative fuels such as ethanol, methanol, natural gas, propane, electricity or biofuels. As of 2000, 75 percent of all new state government fleet purchases are alternativly fueled vehicles. The Kentucky Division of Energy has recommended the state apply these requirements to all state vehicle purchases.

The nationwide use of ethanol as an alternative fuel has in-

creased 250 percent since 1992.[3] However, this is still only a small fraction of the transportation fuels used in the United States. Ethanol is produced from corn and other biomass and is used as a clean burning fuel supplement that is blended with gasoline to produce "gasohol." Gasohol is higher in oxygen content and burns cleaner than gasoline. The American Farm Bureau estimates farmers and other agricultural businesses could increase their earnings annually by as much as $4.5 billion if ethanol use were significantly expanded.[4] Approximately 950 Kentucky state government vehicles are capable of operating on a formula of 85 percent ethanol and 15 percent gasoline.[5] There are currently seven ethanol refueling stations in the state, most of which are in central Kentucky and Louisville.

A factor that will likely lead to the increased use of ethanol is the removal of Methyl Tertiary Butyl Ether (MTBE) from gasoline. National concerns regarding the use of reformulated gasoline were raised after MTBE —one of two fuel oxygenates used in reformulated gas to help improve air quality—was detected in groundwater. The U.S. Environmental Protection Agency (EPA) classifies MTBE as a possible human carcinogen. Reformulated gasoline with MTBE is used in Louisville and in northern Kentucky. The U.S. EPA has called for a nationwide phase out of MTBE. If MTBE were replaced with ethanol, the demand for ethanol could increase from 1.3 billion gallons in 2000 to 3.2 billion gallons in 2004.[6] Kentucky has one ethanol plant, which is located in Louisville (Parallel Products makes ethanol from beverage and food waste). The Hopkinsville Elevator Company has applied for a grant to build a new ethanol plant in Hopkinsville.

The *Clean Cities* Program is a national program aimed at reducing air pollution caused by vehicle emissions. The program emphasizes the use of alternative transportation fuels to improve air quality and reduce dependence on imported oil. In 1993, the City of Louisville and Jefferson County created a partnership with local businesses and government agencies to become the nation's 19th "Clean City." The criteria for becoming a "Clean City" includes committing to accelerated use of alternative fuels in fleet vehicles and promoting partnerships to create the infrastructure needed to support alternatively fueled vehicles. There are currently 80 clean cities in the country.

Footnotes

1. *Kentucky Transportation Cabinet, May 4, 2001.*
2. *Alternatives to Traditional Transportation Fuels 1998, Table 3, U.S. Department of Energy.*
3. *U.S. Refueling Site Counts by State and Fuel Type as of November 20, 2000, U.S. Department of Energy, Alternative Fuels Data Center.*
4. *"Ethanol Can Help End the Grumbling," by C. David Kelly, American Farm Bureau Federation, July 17, 2000.*
5. *Ky. Division of Energy, December 2000.*
6. *"Ability of the U.S. Ethanol Industry to Replace MTBE," by John Urbanchuk, executive vice president, AUS Consultants, March 20, 2000.*

Measures - notes and sources

Measure 1. *Source: U.S. Department of Transportation, Highway Statistics Summary and Annual Vehicle Survey; U.S. Census Bureau.*
Measure 2. *Source: U.S. Department of Transportation, Ky. Transportation Cabinet, U.S. Census Bureau.*

Energy Conservation

Indicator 4. Energy Efficiency and Conservation

At a Glance

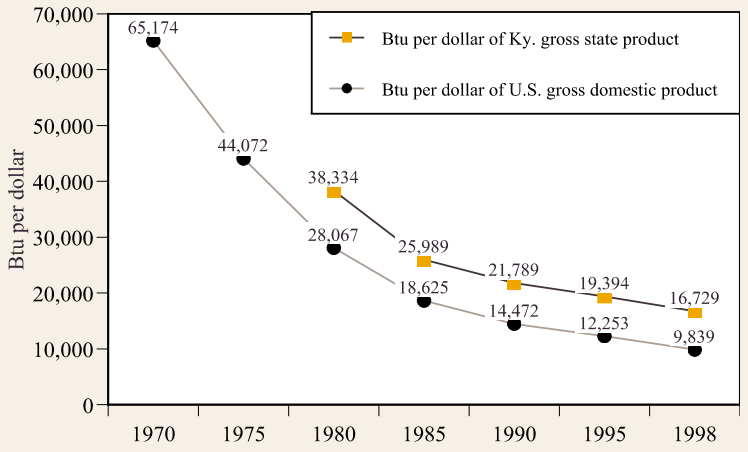
Energy efficiency in Kentucky (Btus used to produce $1 of state gross product)
1980. 38,334
1990. 21,789
1997. 17,832

Energy lost in the electrical generation and transmission process (trillion Btu)
1990. . . . . 405.4
1999 . . . . . 528.8

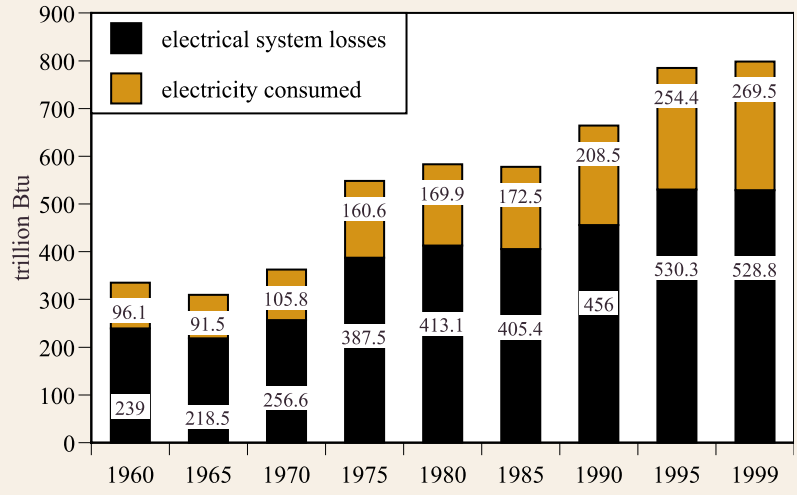
Background For many Kentuckians, the connection between energy, economics and the environment is becoming ever more clear. Volatile natural gas and gasoline prices, combined with environmental concerns such as global warming associated with burning of fossil fuels, has brought the issue of energy back to the national agenda. The Bush administration's national energy policy released in May 2001, emphasizes increased energy production from domestic sources. The policy documents that conservation and energy efficiency are important elements of a sound energy policy. However, the policy offers few incentives to improve energy efficiency, according to a number of critics. This and other energy issues will be subject of congressional debate throughout the year.

Goal Provide for the Commonwealth's energy needs in the most efficient and cost-effective way possible while protecting the environment and conserving our natural resources.

Measure 1. Energy Efficiency - Btus Used to Produce a Dollar of Product



Measure 2. Electrical System Losses in Kentucky



ENERGY CONSERVATION

Progress Energy efficiency is the ability to use less energy to produce the same amount of lighting, heating, transportation and other energy services.[1] One measure of energy efficiency is energy intensity—the amount of energy it takes to produce a dollar of gross domestic product.[2] While Kentucky uses more energy than the national average, it has been following the national trend towards greater energy efficiency. For example, in 1997 Kentucky used 56 percent less energy to produce a dollar of Gross State Product than it did back in the 1980s. Gains in energy efficiency are attributed to technological improvements and better management practices. For example, new home refrigerators use about one third less energy than they used in 1972. The ENERGY STAR program was created by the U.S. EPA in 1992 as a voluntary labeling program designed to promote energy-efficient products in order to reduce carbon dioxide emissions. ENERGY STAR has expanded to cover new homes, most of the building sector, residential heating and cooling equipment, major appliances, office equipment, lighting and consumer electronics. There are 22 Energy Star Partners in Kentucky and one ENERGY STAR building (Aegon Center in Louisville). Aegon Center is a 35-story office building built in 1993 in downtown Louisville. Aegon Center received an Energy Star Label because of the use of highly efficient lighting systems. The building also has advanced climate control systems, which include variable speed drives on all of its air handling units, allowing the energy consumed to vary with demand.

But more can be done to improve energy efficiency and conservation in Kentucky, according to state officials. They indicate that the present rate setting structure provides a powerful incentive for utilities to sell more electricity. Additional measures are needed to encourage utilities to promote consumer efficiency.

State officials also point to the problem of energy loss during the production and transmission of electricity. For example, during 1999 only about 34 percent of the energy generated by large power plants is delivered to the consumer. The remaining 66 percent of the electricity generated was primarily lost due to the inherent inefficiencies in the conversion of fuel to useful energy. Energy is also lost during transmission of energy but accounts for only a small portion, about 5 percent, of the energy lost. Some energy is also used to operate pollution control equipment at power plants. Although 66 percent is a large loss, this is an improvement over previous years. For example, energy losses averaged 71 percent from 1960 through 1990.

Some efforts are underway to assist industries reduce energy waste. A new initiative of the Kentucky Division of Energy, funded by two grants from the U.S. Department of Energy, is the *Kentucky Industries of the Future* Project. Certain energy-intensive industries, including aluminum, steel, mining, chemicals, agriculture, metal casting and forest products, will jointly pursue projects that improve the energy efficiency of their industrial processes and reduce the amount of waste and pollution generated.

Kentucky has also initiated the Energy Efficiency in Government Buildings Program. This program provides technical assistance to help retrofit government buildings to improve energy efficiency and provide help with the operation and maintenance of the systems. The Ky. Division of Energy also administers the Institutional Conservation Program, which helps nonprofit schools and hospitals make improvements in the energy efficiency of their buildings.

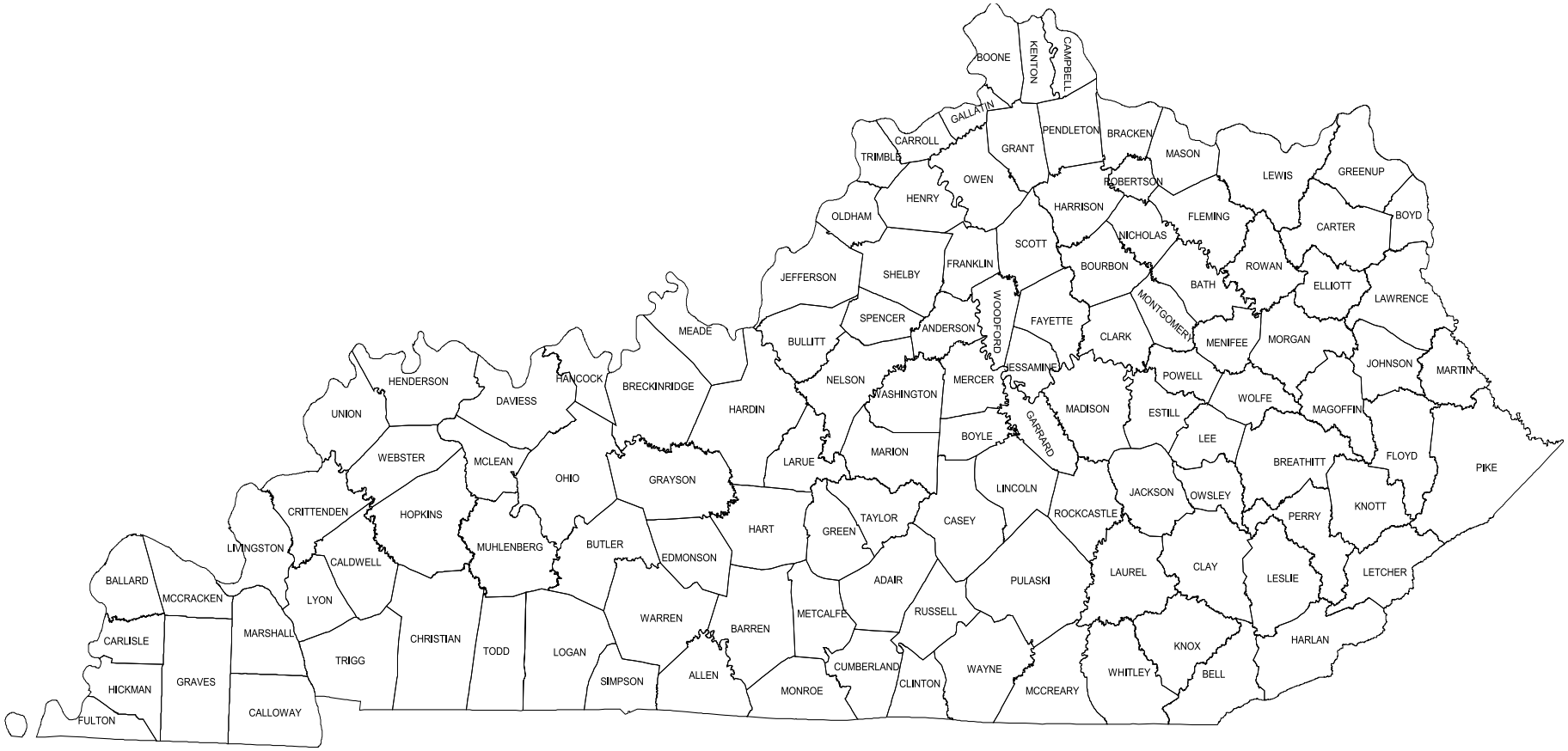
Footnotes

1. *National Energy Policy, Chapter 4, Using Energy Wisely, National Energy Policy Development Group, May 2001.*
2. *Ibid.*
3. *1997, Table 119, Energy Information Administration.*

Measures - notes and sources

Measure 1. *Based on Btu's required to produce a dollar of gross state product. Adjusted for inflation using the consumer price index for 2000. 1998 most recent data available. Source: Bureau of Economic Analysis, National and Regional Income and Product Accounts Data, Energy Information Administration; U.S. Census Bureau.*
Measure 2. *Losses incurred in the generation, transmission, and distribution of electricity plus plant use and unaccounted for electrical system energy losses. Source: State Energy Data Report 1999, Energy Information Administration.*

MAP OF KENTUCKY



INDEX

INDEX

INDEX

INDEX

INDEX

INDEX

Z